## AD-A164 960



AD

TECHNICAL REPORT BRL-TR-2703

# A LUMPED PARAMETER CODE FOR REGENERATIVE LIQUID PROPELLANT GUNS

Terence P. Coffee

December 1985



UTIC FILE COPY

APPROVED FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED.

US ARMY BALLISTIC RESEARCH LABORATORY ABERDEEN PROVING GROUND, MARYLAND

# BLANK PAGES IN THIS DOCUMENT WERE NOT FILMED

Destroy this report when it is no longer needed. Do not return it to the originator.

Additional copies of this report may be obtained from the National Technical Information Service, U. S. Department of Commerce, Springfield, Virginia 22161.

The findings in this report are not to be construed as an official Department of the Army position, unless so designated by other authorized documents.

The use of trade names or manufacturers' names in this report does not constitute indorsement of any commercial product.

# **DISCLAIMER NOTICE**

THIS DOCUMENT IS BEST QUALITY PRACTICABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM	
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER	
Technical Report BRL-TR-2703	AD-A164960		
1. TITLE (and Subtitio)		5. TYPE OF REPORT & PERIOD COVERED	
A Lumped Parameter Code for Regenerative		TR	
Liquid Propellant Guns		6. PERFORMING ORG. REPORT NUMBER	
7. AUTHOR(e)	<u>.</u>	B. CONTRACT OR GRANT NUMBER(*)	
Terence P. Coffee			
PERFORMING ORGANIZATION NAME AND ADDRE	iss	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	
US Army Ballistic Research Labor	atory		
ATTN: SLCBR-IB Aberdeen Proving Ground, MD 2100	5_5066	1L263637D155	
II. CONTROLLING OFFICE NAME AND ADDRESS	<u> </u>	12. REPORT DATE	
US Army Ballistic Research Labor	atorv	December 1985	
ATTN: SLCBR-DD-T	•	13. NUMBER OF PAGES	
Aberdeen Proving Ground, MD 2100	5-5066	158	
14. MONITORING AGENCY NAME & ADDRESS(II ditte	rent from Controlling Office)	15. SECURITY CLASS. (of this report)	
		Unclassified	
		15a. DECLASSIFICATION/DOWNGRADING	
		n/a	

Approved for Public Release; Distribution Unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, If different from Report)

18. SUPPLEMENTARY NOTES



19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

liquid monopropellants: fuel injection . regenerative guns; droplet burning lumped parameter model numerical solution 5.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The governing ordinary differential equations for a lumped parameter model of a regenerative liquid gun are derived. A number of different options and assumptions are implemented. The equations are solved numerically using an efficient and robust computer code. The solutions are compared to a standard code for liquid propellant guns, and the strengths and weaknesses of each method are discussed.

DD 1 /41 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

### TABLE OF CONTENTS

	rage	
	LIST OF ILLUSTRATIONS5	
•	LIST OF TABLES7	
ı.	INTRODUCTION9	
II⊷	THE REGENERATIVE LIQUID PROPELLANT GUN	
III.	GOVERNING EQUATIONS	
IV.	VENT OPTIONS	
	A. VENT 1	
v.	DROPLET BURNING OPTIONS	
	A. DROP 1	
VI.	MASS AND ENERGY BALANCE43	
VII.	NUMERICAL METHOD46	
/III <b>.</b>	NUMERICAL COMPARISONS48	
	REFERENCES57	
	APPENDIX A59	
	APPENDIX B	
	GLOSSARY149	
	DISTRIBUTION LIST	

### LIST OF ILLUSTRATIONS

figure		Page
1	A Regenerative Liquid Propellant Gun	-11
2	A Regenerative Liquid Propellant Gun with an Annular Piston	-12
3	Baseline 25mm Gun - Instantaneous Combustion - Initial Chamber Pressure = 10 MPa Chamber Pressures.  Coffee model (line); Gough model (dot)	•53
4	Baseline 25mm Gun - Instantaneous Combustion - Initial Chamber Pressure = 10 MPa Projectile Velocities. Coffee model (line); Gough model (dot)	
5	Long 25mm Gun - Instantaneous Combustion - Initial Chamber Pressure = 10 MPa Chamber Pressures. Coffee model (line); Gough model (dot)	•55
6	Long 25mm Gun - Instantaneous Combustion - Initial Chamber Pressure = 10 MPa Projectile Velocities. Coffee model (line); Gough model (dot)	•56

Acces	sion For			
NTIS	GRA&I	R		
DTIC	TAB			
Unannounced 🔲				
Justi	fication			
By				
1	Avail an			
Dict	l lpecial	L .		
A-1	23			

### LIST OF TABLES

Table		Page
1	Baseline Input Data for Test Problem	.49
2	Comparison - Baseline Input Parameters	•50
3	Comparison - Back Flow into Liquid Chamber	•50
4	Comparison - Initial Gas Pressure = 10 MPa	-51
5	Comparison - Long Gun Tube	.52

### I. INTRODUCTION

In this paper we derive the governing equations for a lumped parameter model of a regenerative liquid propellant gun and discuss the numerical implementation. Morrison et. al. have covered the background and possible applications of liquid propellant guns. Here the emphasis is on the derivation of a numerical model.

For solid propellant guns, there is a wide range of models.<sup>2</sup>
Precomputer models involved approximations that allowed an analytic, closed-form solution, or else a simple numerical solution leading to tables. The advent of computers allowed the direct numerical solution of ordinary differential equations describing the interior ballistics on a case by case basis. More recently, one-dimensional and even two-dimensional models have been developed, involving the solution of partial differential equations. All of these procedures can give accurate results. The choice of a model depends on the detail desired in the solution.

For regenerative liquid propellant guns, much less work has been done. Pagan and Izod<sup>3</sup> have developed an ordinary differential equation model. This code assumes a particular type of regenerative gun, and has a rather complicated model for the liquid injection into the combustion chamber. Cushman<sup>4</sup> has written a model that has been extensively used at General Electric. The model normally used at the BRL is due to Paul

<sup>&</sup>lt;sup>1</sup>W.F. Morrison, J.D. Knapton, and G. Klingenberg, "Liquid Propellants for Gun Applications," Proceedings of the Seventh International Symposium on Ballistics, The Hague, The Netherlands, April, 1983.

<sup>&</sup>lt;sup>2</sup>P.G. Baer, "Practical Interior Ballistic Analysis of Guns," Progress in Astronautics and Aeronautics, <u>Interior Ballistics of Guns</u>, (H. Krier and M. Summerfield, ed.), Vol 66, 1979.

<sup>&</sup>lt;sup>3</sup>G. Pagan and D.C.A. Izod, "Regenerative Liquid Propellant Gun Modelling," Proceedings of the Seventh International Symposium on Ballistics, The Hague, The Netherlands, April, 1983.

<sup>&</sup>lt;sup>4</sup>P.G. Cushman, "Regenerative Liquid Propellant Gun Simulation User's Manual," GE Report 84-POD-004, December, 1983.

Gough.<sup>5</sup> This code uses a lumped parameter representation (ordinary differential equations) for the liquid reservoir and combustion chamber. The gun tube is represented by partial differential equations. This code has a number of options, including a traveling charge projectile. Since both the design of the regenerative liquid gun and the assumptions made in the model are under development, additional options are periodically added to the code.

The purpose of this report is twofold. First we develop a complete lumped parameter code (only ordinary differential equations) to describe the regenerative liquid propellant gun. This code is not as general as that developed by Gough. However, it runs much faster, which allows parametric studies to be made easily. Also, the code is written as far as possible in a modular form. Additional options can be added with a minimum amount of effort. As new gun designs are developed, or new assumptions about the behavior in the gun are tried, these can be tested fairly easily.

### II. THE REGENERATIVE LIQUID PROPELLANT GUN

Figs. 1 and 2 show regenerative liquid propellant guns with an in-line piston. Another possible design is the reverse annular gun, where the piston is wrapped around the barrel and moves in the direction of the muzzle. The reverse annular gun includes an intermediate combustion chamber. While we will only consider in-line pistons, in order to be consistent with the notation used by Gough, the regions of the gun will be denoted as regions 1, 3, and 4.

Region 1 is the liquid propellant reservoir. The monopropellant is pumped into the reservoir at the beginning of the firing cycle. A primer is ignited in the combustion chamber (region 3). As the chamber is pressurized, the piston is forced back. Because of the piston area

<sup>&</sup>lt;sup>5</sup>P.S. Gough, "A Model of the Interior Ballistics of Hybrid Liquid-Propellant Guns," Final Report, Contract DAAK11-82-C-0154, PGA-TR-83-4, September 1983.

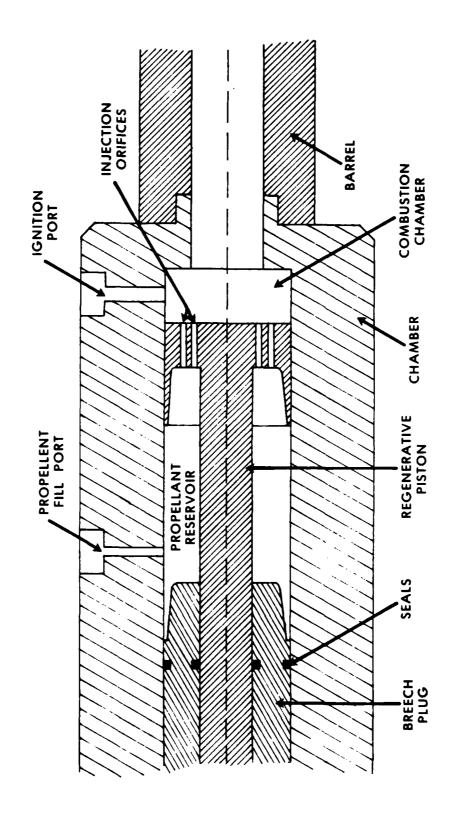
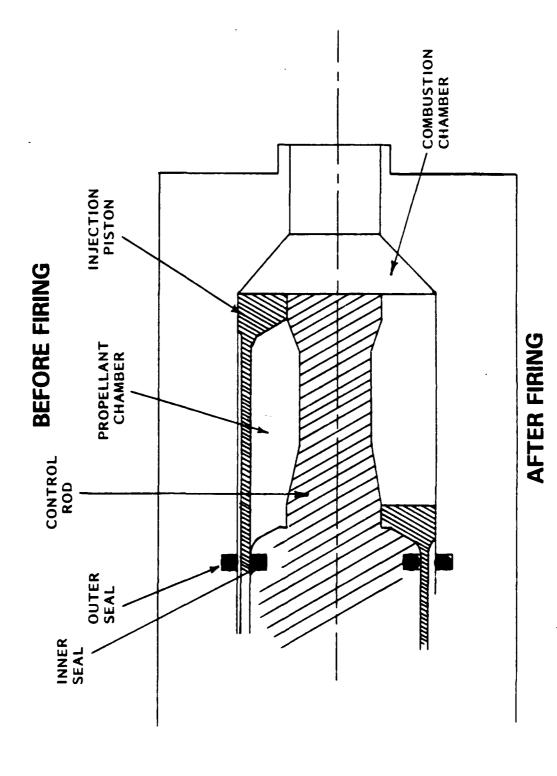


Figure 1. A Regenerative Liquid Propellant Gun



THE PARTIES OF THE PROPERTY OF

A Regenerative Liquid Propellant Gun with an Annular Piston Figure 2.

differential between the two regions, the liquid pressure is higher than the combustion chamber pressure. So liquid propellant is forced through circular holes in the piston face, and ignites and burns in the combustion chamber. Eventually, the pressure pushes the projectile down the gun tube (region 4).

In most problems involving liquids, the liquid can be considered incompressible. Because of the high pressures in a gun, this is not a good approximation, and the compressibility of the liquid propellant will be considered.

In the gun, it is possible that gas from the combustion chamber can be forced into the liquid chamber. This is most likely to occur at early times, when the primer causes the initial pressure rise in the combustion chamber. Because of the inertia of the piston, there may be a delay before the liquid pressure also rises. The modeling of bubbles in a compressible liquid is complicated, so we will assume that there is no mass flow into region 1. In the experimental fixture grease is used to block the holes so that flow into the liquid reservoir is less likely.

The orifice flow through the vents in the piston is quite complicated. Here we assume that the piston face is infinitely thin, and ignore the behavior in the orifice. The mass of the piston will be considered.

The piston design considered here was used in early test fixtures,<sup>6</sup> <sup>7</sup> but is not convenient for actual guns. Since the vent holes must be plugged before each shot, rapid fire is impossible. Other piston designs will be considered below.

<sup>&</sup>lt;sup>6</sup>W.F. Morrison, M.J. Bulman, P.G. Baer, and C.F. Banz, "The Interior Ballistics of Regenerative Liquid Propellant Guns," 1984 JANNAF Propulsion Meeting, New Orleans, LA, CPIA Publication 390, February, 1984.

<sup>&</sup>lt;sup>7</sup>P.G. Baer, C.F. Banz, I.W. May and W.F. Morrison, "A Propulsion System Comparison Study for the 120-MM Anti-Armor Cannon," 1984 JANNAF Propulsion Meeting, New Orleans, LA, CPIA Publication 390, February, 1984.

The behavior in the combustion chamber is very complicated. A primer is ignited in the chamber, leading to a gradual pressure rise. Liquid jets are forced out of the vent holes. These jets may break up into droplets because of hydrodynamic forces between the gas and the liquid or due to impact on the wall of the chamber. The droplets formed may break up further or coalesce. The propellant will eventually ignite, and may burn as individual droplets or as an envelope flame. These processes are not well understood at low pressure, and essentially no work has been done at gun pressures. Therefore, simplifying assumptions are necessary.

As a first approximation, we assume that the liquid burns instantaneously as soon as it enters the combustion chamber, releasing all its energy. The combustion chamber is treated as a homogeneous region.

The primer is assumed to be the same liquid as the propellant. Normally the combustion of the primer is not followed in detail. Instead the initial pressure in the combustion chamber is an input parameter. Then the amount of propellant needed to produce this pressure is calculated, and this is taken as the mass of the primer. The piston and projectile are not allowed to move during the burning of the primer. Later a somewhat more complicated primer option will be discussed.

There is some evidence that liquid accumulates in the combustion chamber at the beginning of the firing cycle, which changes the behavior of the pressure rise. Later we introduce finite burning rates for the liquid propellant, in an attempt to model, at least crudely, the effects of possible propellant accumulation.

Last, we have the behavior in the gun tube itself. In the Gough code, this region is modeled by one-dimensional partial differential equations. This is necessary because of the traveling charge option included in this code. We will consider this region as a lumped parameter region, using the

Lagrange pressure distribution. This has been successfully used to model the behavior of solid propellant guns.  $^{8}$ 

Below, we derive the governing equations for the simple lumped parameter model just described. Later, additional options will be considered.

### III. GOVERNING EQUATIONS

With the above assumptions, the regenerative gun behavior can be modeled by 13 ordinary differential equations ([1] to [13]).

The equations governing the piston motion can be derived simply. Let  $V_1$  be the volume of the fuel chamber, and  $A_1$  be the area of the fuel side of the piston (this area includes the vent holes). Let  $V_{10}$  be the initial volume of the liquid chamber. Let  $S_{ps}$  be the piston travel (to the left) and  $V_{ps}$  be the piston velocity. Then

$$V_1 = V_{10} - S_{ps} A_1$$
 (1)

Taking the derivative,

$$[1] \quad \frac{dV_1}{dt} = -V_{ps} A_1 . \tag{2}$$

The acceleration of the piston equals the force on the piston divided by the mass of the piston, that is

<sup>&</sup>lt;sup>8</sup>J. Corner, <u>Theory of the Interior Ballistics of Guns</u>, Wiley, New York, 1950.

[2] 
$$\frac{dV_{ps}}{dt} = \frac{g_{o}}{M_{ps}} [p_{3}(A_{3} - A_{v}) - p_{1} (A_{1} - A_{v})], \qquad (3)$$

where  $A_3$  is the area of the combustion side of the piston,  $A_v$  is the area of the vent holes,  $p_1$  is the pressure in the liquid chamber,  $p_3$  is the pressure in the combustion chamber, and  $M_{ps}$  is the mass of the piston. The quantity  $g_0 = 10^7$  gm/s-cm-MPa is a conversion constant to put the acceleration in the desired units of cm<sup>2</sup>/s. By assumption, the pressures are constant throughout the two chambers. Then the equation governing the piston travel is

$$[3] \quad \frac{dS_{ps}}{dt} = V_{ps} \quad . \tag{4}$$

As the piston moves to the left, liquid propellant is forced through the vent holes. This is governed by Bernoulli's equation<sup>9</sup>

$$\frac{p_3 - p_1}{\rho_1} + \frac{v_3^2 - v_1^2}{2} = 0 \tag{5}$$

where  $\rho_1$  is the density of the propellant in region 1,  $v_1$  is the velocity of the fluid on the liquid side, and  $v_3$  is the velocity of the injected fluid on the combustion chamber side of the piston. In using this equation, the flow in the orifices is assumed to be frictionless incompressible flow. The potential energy due to height differences has been left out of the equation.

<sup>&</sup>lt;sup>9</sup>W.F. Hughes and J.A. Brighton, <u>Fluid Dynamics</u>, Schaum's Outline Series, McGraw-Hill, New York, 1967.

Since the liquid in region 1 is a homogeneous mixture, we take  $\mathbf{v}_1$  to be zero. Eq. (5) can be rewritten as

$$\rho_1 \quad v_3 = \sqrt{2\rho_1 (p_1 - p_3)}$$
 (6)

The mass flow rate through the orifices, denoted by  $^{m}_{13}$ , equals  $\rho_1 v_3 ^{A}_{V}$ . There is usually some narrowing or constriction of the jet. This is taken into account by introducing a discharge coefficient  $^{C}_{D}$ . Then

$$\hat{m}_{13} = C_D A_v \sqrt{2g_o \rho_1 (p_1 - p_3)}, \quad p_1 > p_3.$$

$$= 0 \qquad p_1 < p_3.$$
(7)

For short circular orifices at atmospheric pressure, the discharge coefficient should be about 0.61 to 0.63. $^{10}$  The orifices are plugged at the beginning of the firing cycle, so that gas will not be forced into region 1. So the mass flux is set to zero if  $p_1 < p_3$ .

Now let  $\mathbf{M}_{\hat{\mathbf{l}}}$  be the mass of the liquid in region 1. By conservation of mass,

$$\frac{dM_1}{dt} = - \dot{m}_{13} . \tag{8}$$

The mass is equal to the density times the volume of region 1. Rearranging eq. (8),

<sup>10</sup>W. Kaufman, Fluid Mechanics, McGraw-Hill, New York, 1963.

[4] 
$$\frac{d\rho_1}{dt} = -\frac{\rho_1}{V_1} \frac{dV_1}{dt} - \frac{\dot{m}_{13}}{V_1}.$$
 (9)

This equation becomes singular as the volume approaches zero. This problem will be discussed below in the section on the numerical solution of the equations.

The bulk modulus K of a compressible fluid is defined by 11

$$\rho_1 \left( \frac{\partial p_1}{\partial \rho_1} \right)_T = K , \qquad (10)$$

where the subscript T indicates that the derivative is evaluated with the temperature constant. The liquid is assumed to be isothermal. The bulk modulus does vary with pressure. For lack of better information, we assume a simple linear form

$$K = K_1 + K_2 p_1 .$$
 (11)

Combining eq. (10) and (11), and solving for  $p_1$ ,

$$p_1 = [(k\rho_1)^{K_2} - K_1]/K_2 , \qquad (12)$$

where k is a constant. Let  $\rho_0$  be the density at p=0. Usually the density is known at p = 1 atm., but compared to gun pressure ranges 1 atm. is essentially zero. Then solving for k and substituting into eq. (12)

$$p_1 = \frac{K_1}{K_2} \left[ \left( \frac{\rho_1}{\rho_0} \right)^{K_2} - 1 \right]. \tag{13}$$

<sup>11</sup>R.W. Fox and A.T. McDonald, <u>Introduction to Fluid Mechanics</u>, 2nd ed., John Wiley and Sons, NY, 1978.

Taking derivatives,

$$\frac{dp_1}{dt} = \frac{K_1}{\rho_1} \left( \frac{\rho_1}{\rho_0} \right)^{K_2} \frac{d\rho_1}{dt}$$
 (14)

and combining eq. (11) and (13) this can be rewritten as

$$\frac{\mathrm{d}\mathrm{p}_{1}}{\mathrm{d}\mathrm{t}} = \frac{\mathrm{K}}{\mathrm{p}_{1}} \frac{\mathrm{d}\mathrm{p}_{1}}{\mathrm{d}\mathrm{t}} . \tag{15}$$

This can be expressed in terms of the speed of sound in the liquid  $\mathbf{c}_1\text{,}$  which is given by  $^{12}$ 

$$c_1 = \sqrt{g_0 \left(\frac{\partial p_1}{\partial \rho_1}\right)_s} \tag{16}$$

or

$$c = \sqrt{g_0 K/\rho_1} . ag{17}$$

Then eq. (15) becomes

[5] 
$$\frac{dp}{dt}^{1} = \frac{c_{1}^{2}}{g_{0}^{2}} \frac{d\rho_{1}}{dt}$$
 (18)

Now consider the combustion chamber. By analogy with eq. [1],

<sup>12</sup>W. Band, Introduction to Mathematical Physics, D. Van Nostrand Company, Princeton, NJ., 1960.

$$[6] \quad \frac{dV_3}{dt} = V_{ps} A_3 . \tag{19}$$

The equation for conservation of mass is

$$-\frac{dM_3}{dt} = \dot{m}_{13} - \dot{m}_{34} , \qquad (20)$$

where  $\mathring{\mathbf{m}}_{34}$  is the mass flux from region 3 to region 4. It follows that

[7] 
$$\frac{d\rho_3}{dt} = -\frac{\rho_3}{V_3} \frac{dV_3}{dt} + \frac{\dot{m}_{13} - \dot{m}_{34}}{V_3} . \tag{21}$$

Finally, we need an equation for the pressure in region 3. This will be based on the Noble-Abel equation of state  $^8$ 

$$p_3 = \rho_3 RT_3/W(1 - \rho_3 b)$$
, (22)

where  $T_3$  is the temperature in region 3, R is the universal gas constant, W is the molecular weight of the gas, and b is the covolume. This can also be written as

$$p_3 = \rho_3(\gamma - 1) c_v T_3/(1 - \rho_3 b)$$
, (23)

where  $c_v$  is the specific heat at constant volume and  $\gamma$  is the specific heat racio  $c_p/c_v$ . It will again be useful to determine the speed of sound<sup>8</sup>

$$c_3 = \sqrt{g_o \left(\frac{\partial p_3}{\partial \rho_3}\right)_s}$$
 (24)

where s is the entropy. Taking the partial derivative of eq. (23), after some algebra

$$\left(\frac{\partial p_3}{\partial \rho_3}\right)_s = \frac{\gamma p_3}{\rho_3 (1 - b\rho_3)} \tag{25}$$

where we have used the fact that 13

$$\left(\frac{\partial T_3}{\partial \rho_3}\right)_S = \frac{(\gamma - 1)T_3}{\rho_3(1 - \rho_3 b)} .$$
(26)

Combining eq. (24) and (25) results in

$$c_{3} = \sqrt{\frac{g_{o} \Upsilon P_{3}}{\rho_{3}(1 - \rho_{3}b)}} . \tag{27}$$

The energy equation for a homogeneous gas can be written as  $^{14}$ 

$$\rho_3 c_p \frac{dT_3}{dt} = \left(\frac{\partial ln\hat{V}_3}{\partial lnT_3}\right) p_3 \frac{\partial \rho_3}{\partial t} + s_3$$
 (28)

where the spatial terms and the viscosity have been ignored. The quantity  $\hat{V}=1/\rho_3$ . Using the Noble-Abel equation,

$$\left(\frac{\partial \ln \hat{v}_3}{\partial \ln T_3}\right)_{p_3} = 1 - b\rho_3 , \qquad (29)$$

<sup>13</sup>G.N. Lewis and M. Randall, <u>Thermodynamics</u>, McGraw-Hill, New York, 1961.

<sup>&</sup>lt;sup>14</sup>R.B. Bird and W.E. Stewart, <u>Transport Phenomena</u>, John Wiley and Sons, New York, 1960.

and eq. (28) becomes

$$\rho_3 c_p \frac{\partial T_3}{\partial t} = (1 - b\rho_3) \frac{d\rho_3}{dt} + S_3$$
 (30)

The source term  $S_3$  is due to the energy release when the liquid combusts. In general,

$$S_3 = - \Sigma h_i R_i M_i$$
 (31)

where  $h_i$  is the enthalpy of the quantity i,  $R_i$  is the rate of production of the quantity i, and  $M_i$  is the mass of the quantity i. The rate of production of gas in region 3 is  $m_{13}/V_3$ , since the liquid combusts instantaneously when it enters the combustion chamber. The outflow is irrelevant since it does not cause a change in enthalpy.

Again from the Noble-Abel equation,

$$\rho_{3} c_{p} \frac{dT_{3}}{dt} = \frac{\gamma}{\gamma - 1} \left[ (1 - b\rho_{3}) \frac{d\rho_{3}}{dt} - \frac{\rho_{3}}{\rho_{3}} \frac{d\rho_{3}}{dt} \right]. \tag{32}$$

Substituting into eq. (28) and doing the algebra

[8] 
$$\frac{dp_3}{dt} = \frac{c_3^2}{g_0} \frac{d\rho_3}{dt} + \frac{\mathring{m}_{13}(h_1 - h_3)(\gamma - 1)}{V_3 - bM_3} \qquad \mathring{m}_{34} > 0. \qquad (33)$$

Normally, gas will flow from the combustion chamber into the gun tube. But if the gas flow from region 3 to region 4  $(\mathring{m}_{34})$  is negative, there will be an additional source term. In this case

[8] 
$$\frac{dp_3}{dt} = \frac{c_3^2}{g_0^2} \frac{dp}{dt} + \frac{\dot{m}_{13}(h_1 - h_3)(\gamma - 1)}{v_3 - bM_3} \qquad \dot{m}_{34} < 0$$

$$-\frac{\dot{m}_{34}(h_4 - h_3)(\gamma - 1)}{v_3 - bM_3} . \tag{34}$$

The enthalpy of the liquid is given by

$$h_1 = e_1 + p_1/\rho_1$$
, (35)

where  $\mathbf{e}_1$  is the chemical energy of the liquid. This is obtained from closed bomb tests. The enthalpy of the gas is given by

$$h_3 = c_v T_3 + p_3/\rho_3 = c_p T_3 + bp_3$$
 (36)

Finally, we consider the gun tube (region 4). The volume has the standard equation

$$[9] \quad \frac{dV_4}{d\overline{t}} = V_{pj} A_4 , \qquad (37)$$

where  $V_{pj}$  is the velocity of the projectile and  $A_4$  is the area of the gun tube. To model this as a lumped parameter region, we assume a Lagrange pressure distribution. That is, the density is constant with respect to space. Assuming that the gas velocity at the gun tube entrance is zero, it follows that the gas velocity is a linear function of distance. Since there is a mass flow into the gun tube, this is not strictly correct. However, the derivation with a velocity at the entrance is much more complicated, and the standard Lagrange distribution is used as a first approximation. This leads to

$$p(x) = p_R + (p_R - p_{RS}) \frac{M_4}{2M_{pj}} \left[ 1 - \left( \frac{x}{x_R} \right)^2 \right]$$
 (38)

where  $\mathbf{x}_{R}$  is the distance from the tube entrance to the base of the projectile. Integrating over the tube length,

$$p_{4} = p_{R} \left( 1 + \frac{M_{4}}{3M_{pj}} \right) - p_{RS} \frac{M_{4}}{3M_{pj}}$$
 (39)

where  $\mathbf{p}_4$  is the average pressure in the tube. This can be rearranged as

$$p_{R} = \frac{p_{4} + p_{RS} \frac{M_{4}/(3M_{pj})}{1 + M_{4}/(3M_{pj})} \qquad p_{R} > p_{RS}$$
 (40)

where  $p_R$  is the pressure at the right end of the gun tube (base of the projectile),  $M_4$  is the mass of the gas in the tube,  $M_{pj}$  is the mass of the projectile, and  $p_{RS}$  is the resistance pressure. The latter is an input parameter, which takes into account the shot start engraving force and frictional forces between the projectile and the bore. The pressure at the gun tube entrance is

$$p_{L} = p_{R} \left( 1 + \frac{M_{4}}{2M_{pj}} \right) - p_{RS} \frac{M_{4}}{2M_{pj}} \qquad p_{R} > p_{RS} .$$
 (41)

The above two equations assume that the projectile has started to move, creating a pressure differential. If the projectile has not moved, then region 4 is treated as just an extension of region 3, that is,

$$P_4 = P_R = P_L = P_3$$
 (42)

Given the pressure on the projectile, the acceleration equation is

[10] 
$$\frac{dV_{pj}}{dt} = (P_R - P_{RS}) A_4 g_0/M_{pj} P_R > P_{RS} (43)$$

$$= 0 P_R < P_{RS}.$$

The projectile travel  $S_{\mbox{\scriptsize pj}}$  is then given by

$$\begin{bmatrix} 11 \end{bmatrix} \quad \frac{dS}{dt} = V_{pj} \quad . \tag{44}$$

The final two differential equations are exactly analogous to region 3. That is,

[12] 
$$\frac{d\rho_4}{dt} = -\frac{\rho_4}{V_4} \frac{dV_4}{dt} + \frac{\dot{m}_{34}}{V_4}$$
 (45)

where  $\rho_{\Delta}$  is the density of the gas in region 4, and

[13] 
$$\frac{dp_4}{dt} = \frac{c_4^2}{g_0} \frac{d\rho_4}{dt} + \frac{\dot{m}_{34}(h_3 - h_4)(\gamma - 1)}{v_4 - bM_4} \qquad \dot{m}_{34} > 0$$
 (46)

$$= \frac{c_4^2}{g_0^2} \frac{d\rho_4}{dt} \qquad \dot{m}_{34} < 0$$

where  $\mathring{\mathbf{m}}_{34}$  is the mass flux into region 4, given by

$$\dot{m}_{34} = c_D' A_4 \sqrt{2g_0 \rho_3(p_3 - p_4)} \qquad p_3 > p_4 \qquad (47)$$

$$= -c_D' A_4 \sqrt{2g_0 \rho_4(p_4 - p_3)} \qquad p_3 < p_4.$$

The speed of sound in region 4 is given by

$$c_4 = \sqrt{\frac{g_0 YP_4}{\rho_4 (1 - b\rho_4)}}$$
 (48)

### IV. VENT OPTIONS

The model described above has a simple vent option. The vent area between the liquid chamber and the combusion chamber is fixed, and equals the total area of the holes drilled in the piston. Three vent options are included in the code, where the constant vent area is a special case of option 1. For each option, the input and the vent area calculation is in a separate subroutine, and other options can be added easily.

### A. VENT 1

A table of vent areas is read in as a function of piston travel. Linear interpolation is used to determine the vent area for any given piston travel. The case of constant vent area is a special case of this option.

### B. VENT 2

A standard concept in interior ballistics is that of the optimum (constant pressure) gun. That is, for a given gun design, we want to know the maximum possible performance (muzzle velocity) for a given limit on the breech pressure. There can also be an acceleration limit on the projectile (base pressure). For a lumped parameter solid propellant gun, this is fairly straightforward. These models usually assume a Lagrange pressure distribution or a similar fixed pressure distribution. There is a known relation between the breech pressure and the pressure at the base of the projectile. Usually, the shot start pressure is chosen as equal to the desired base pressure, so the projectile does not move until the desired pressure is reached. The burning rate for the propellant is adjusted so as

to reach the desired maximum breech (base) pressure and remain at this level until propellant burnout.

For a liquid propellant gun, the relation between the breech pressure and the base pressure is not known analytically, because of the added complication of the piston motion. Also, the burning rate cannot be controlled directly, since this depends on the mass flux into the combustion chamber. What can be controlled is the vent area.

Our scheme assumes that there is a limit both on the breech pressure and the base pressure (projectile acceleration). The input parameters are AVMIN = initial vent area = minimum vent area, AVMAX = maximum vent area, and ACS = maximum acceleration (kilo-g). The desired base pressure is

$$P_{D} = M_{pj} (.098146) ACS/A_4 - P_{RS}$$
 (49)

where the number .098146 is a conversion constant. Then we define

$$RATIO = (P_D - P_R)/P_D$$
 (50)

and let

$$A_{v} \text{ (new) = } A_{v} \text{ (old) (1 + AK*RATIO)}$$
 (51)

where AK is a proportionality constant (usually about one). However, the new vent area is overridden by AVMIN and AXMAX.

In practice, the vent area stays at AVMIN until the desired base pressure has been achieved. The projectile then starts moving, and the base pressure falls. The vent area then increases over several time steps to maintain the base pressure. There is a delay in increasing the vent area and a further delay until the pressure increase in the combustion chamber affects the pressure distribution in the gun tube. So the base pressure

falls and then increases again. AVMAX is normally chosen by trial and error so that the breech pressure does not exceed a desired limit. Once AVMAX is reached, the breech and base pressures again fall off.

There appears to be no way to implement exactly a constant pressure algorithm for the regenerative gun without major modifications in the piston motion algorithm. The above algorithm does give an approximation to the maximum performance possible for given restrictions on the breech pressure and the base pressure.

### C. VENT 3

Recent regenerative guns have been designed with an annular piston (see fig. 2). The piston has a circular hole in the center around a central rod or bolt. The fuel is stored between the bolt and the piston. The bolt remains fixed as the piston moves. The motion of the piston opens a wider annular gap, and fuel is forced between the piston and the bolt.

We assume that the bolt is made of frustrums of cones. Let  $\mathbf{x_i}$  be the distance from the combustion chamber end of the bolt to the junction between piece i-1 and i. Then the volume of the bolt is

$$V_{b} = \sum_{i=2}^{N} \frac{\pi}{3} (x_{i} - x_{i-1}) (r_{i}^{2} + r_{i}r_{i-1} + r_{i-1}^{2}) .$$
 (52)

Again we assume that the piston has zero thickness. Then the volume of the liquid is

$$V_{1} = \pi r_{L}^{2} (x_{N} - x_{1}) - V_{b}$$

$$= \sum_{i=2}^{N} \pi (x_{i} - x_{i-1}) [r_{L}^{2} - \frac{1}{3} (r_{i}^{2} + r_{i}r_{i-1} + r_{i-1}^{2})]$$
(53)

where  $r_L$  is the radius of the liquid chamber and N-l is the number of pieces in the bolt.

The required information to determine the geometry is the  $x_i$  and the  $r_i$  values. In practice, we often want to specify the total liquid volume and the vent areas for parametric studies. So the actual input used is a table of distances and vent areas, as well as the volume and area of the liquid chamber, and the area of the hole in the piston. The radii and then the volume of the chamber can be computed. By equation (53), the volume  $V_1$  is directly proportional to the distances  $x_i$ . So the  $x_i$  are scaled to give the desired  $V_1$ . If the dimensions of an actual gun are used, where the input liquid volume matches the input dimensions, no adjustment is made.

There are several changes necessary in the previous governing equations. Let the piston travel satisfy the relation  $\mathbf{x_{i-1}} < \mathbf{S_{ps}} < \mathbf{x_{i}}$ . The radius of the rod at this point can be found by linear interpolation

$$r = r_{i-1} + \frac{(s_{ps} - x_{i-1})}{(x_i - x_{i-1})} (r_i - r_{i-1}) .$$
 (54)

Taking the derivative,

$$\frac{dr}{dt} = V_{ps} \frac{(r_{i} - r_{i-1})}{(x_{i} - x_{i-1})}.$$
 (55)

Now the volume of the liquid reservoir is given by

$$V_{1} = V_{10} - \pi r_{L}^{2} (S_{ps} - x_{1}) + \frac{\pi}{3} (S_{ps} - x_{i-1})(r^{2} + r r_{i-1} + r_{i-1}^{2})$$

$$+ \sum_{j=2}^{i-1} \frac{\pi}{3} (x_{j} - x_{j-1}) (r_{j}^{2} + r_{j} r_{j-1} + r_{j-1}^{2})$$
(56)

or taking derivatives

$$\frac{dV_{1}}{dt} = -\pi r_{L}^{2} \frac{dS_{ps}}{dt} + \frac{\pi}{3} \frac{dS_{ps}}{dt} (r^{2} + r r_{i-1} + r_{i-1}^{2})$$

$$+ \frac{\pi}{3} (S_{ps} - x_{i-1}) (2r \frac{dr}{dt} + r_{i-1} \frac{dr}{dt}) .$$
(57)

Rearranging this,

[1] 
$$\frac{dV_{1}}{dt} = -V_{ps} A_{1} + \frac{\pi}{3} \left[ V_{ps} (r^{2} + r r_{i-1} + r_{i-1}^{2}) + (S_{ps} - x_{i-1}) (2r + r_{i-1}) \frac{dr}{dt} \right].$$
 (58)

Similarly,

[6] 
$$\frac{dV_3}{dt} = V_{ps} A_3 - \frac{\pi}{3} \left[ V_{ps} (r^2 + r r_{i-1} + r_{i-1}^2) + (s_{ps} - x_{i-1}) (2r + r_{i-1}) \frac{dr}{dt} \right].$$
 (59)

The piston acceleration is given by

[2] 
$$\frac{dV_{ps}}{dt} = \frac{g_0}{M_{ps}} [P_3 (A_3 - A_h) - P_1 (A_1 - A_h)]$$
 (60)

where  $\mathbf{A}_{h}$  is the area of the hole in the piston. The acceleration on the piston no longer depends on the vent area. The vent area itself is given by

$$A_{\mathbf{V}}(S_{\mathbf{p}\mathbf{s}}) = A_{\mathbf{h}} - A_{\mathbf{b}}(S_{\mathbf{p}\mathbf{s}}). \tag{61}$$

This is used to compute the mass flux  $\mathbf{m}_{13}$ . The other governing equations are unchanged.

### V. DROPLET BURNING OPTIONS

So far we have assumed that the liquid combusts instantaneously upon entering the combustion chamber. There is some evidence, however, that liquid accumulates in the combustion chamber. To see what effect this may have on the gun performance, simple approximations for the formation and combustion of droplets in the combustion chamber are considered.

The behavior of the liquid as it enters the combustion chamber is very complicated. We will assume that the liquid instantaneously forms droplets of a fixed size. The droplets will then combust at some given rate. The initial size of the droplets is an input parameter.

In the above equations, we included the possibility that gas could flow from the gun tube back into the combustion chamber. In practice, this occurs only rarely, and the amounts involved are very small. Since the equations below are already very complicated, an additional assumption is made that the mass flux from the combustion chamber to the gun tube is positive. This eliminates some of the algebra, and has no noticeable effect on the results.

### A. DROP 1

The liquid combusts instantaneously as it enters the combustion chamber, releasing all of its chemical energy. This is the option derived above.

### B. DROP 2

Gough<sup>5</sup> has implemented a simple droplet combustion scheme. The droplets have a fixed size at all times, and combustion simply reduces the number of drops. The effect of droplet accumulation may be considered, without implementing a whole distribution of droplet sizes. We will derive the appropriate equations for this scheme in our lumped parameter model.

Let  ${\rm M_{L3}}$  be the liquid mass in region 3,  ${\rm V_{L3}}$  be the liquid volume,  ${\rm M_{G3}}$  be the gas mass, and  ${\rm V_{G3}}$  be the gas volume. Then

$$\rho_{L3} = M_{L3}/V_{L3} \tag{62}$$

and

$$\rho_{G3} = M_{G3}/V_{G3} \tag{63}$$

where  $\rho_{L3}$  is the density of the liquid and  $\rho_{G3}$  is the density of the gas. Define the porosity

$$\varepsilon_3 = V_{G3}/V_3 . \tag{64}$$

Then

$$\rho_3 = M_3/V_3 \tag{65}$$

= 
$$(1 - \epsilon_3) P_{L3} + \epsilon_3 \rho_{G3}$$
.

Following eq. (17), the speed of sound in the liquid is

$$c_{L3} = \sqrt{g_0 K/\rho_{L3}}$$
 (66)

and following eq. (27) the speed of sound in the gas is

$$c_{G3} = \sqrt{\frac{g_0 \ YP_3}{\rho_{G3} \ (1 - b \ \rho_{G3})}}$$
 (67)

The liquid is still considered to be isothermal, so the internal energy does not change. The heat transfer to the liquid is ignored because of the complexity of including this effect. The enthalpy of the liquid is

$$h_{1,3} = e_1 + P_3/\rho_{1,3} \tag{68}$$

where  $\mathbf{e}_1$  is the chemical energy of the liquid. Let  $\mathbf{m}_3$  be the rate at which the liquid in region 3 is combusting and forming the final gas products.

The thirteen equations derived in Section III are the same except for the energy equations [8] and [13]. To derive the new equations, we need some preliminary results. Consider the mass conservation equations

$$\frac{dM_{L3}}{dt} = \frac{d}{dt} \left[ \rho_{L3} (1 - \epsilon_3) V_3 \right]$$

$$= \mathring{m}_{13} - \frac{\mathring{M}_{L3}}{\mathring{M}_3} \mathring{m}_{34} - \mathring{m}_3$$
(69)

and

$$\frac{dM_{G3}}{dt} = \frac{d}{dt} \left[ \rho_{G3} \epsilon_3 v_3 \right]$$

$$= \dot{m}_3 - \frac{M_{G3}}{M_3} \dot{m}_{34} . \qquad (70)$$

Expanding the equations,

$$\frac{d\rho_{L3}}{dt} (1 - \epsilon_3) V_3 - \rho_{L3} V_3 \frac{d\epsilon_3}{dt} + \rho_{L3} (1 - \epsilon_3) \frac{dV_3}{dt}$$
 (71)

$$= \dot{m}_{13} - \frac{M_{L3}}{M_3} \dot{m}_{34} - \dot{m}_3$$

$$\frac{d\rho_{G3}}{dt} \epsilon_3 v_3 + \rho_{G3} v_3 - \frac{d\epsilon_3}{dt} + \rho_{G3} \epsilon_3 - \frac{dv_3}{dt}$$
 (72)

$$= \dot{m}_3 - \frac{\dot{M}_{G3}}{\dot{M}_3} \dot{m}_{34} .$$

Combining the two equations,

$$\frac{d\rho_{L3}}{dt} \frac{(1-\epsilon_3)}{\rho_{L3}} + \frac{d\rho_{G3}}{dt} \frac{\epsilon_3}{\rho_{G3}} + \frac{1}{v_3} \frac{dv_3}{dt}$$
(73)

$$= \frac{1}{\rho_{L3}} \bar{v}_3 \left[ \dot{m}_{13} - \frac{\dot{M}_{L3}}{\dot{M}_3} \dot{m}_{34} - \dot{m}_3 \right] + \frac{1}{\rho_{G3}} \bar{v}_3 \left[ \dot{m}_3 - \frac{\dot{M}_{G3}}{\dot{M}_3} \dot{m}_{34} \right].$$

Now consider the pressure equations. Assume that the gas and liquid pressures in the region are identical. The liquid pressure equation, following eq. (18), is

$$\frac{dp_3}{dt} = \frac{c_{L3}^2}{g_0} \frac{d\rho_{L3}}{dt} \tag{74}$$

and the gas phase equation, following eq. (33), is

$$\frac{dp_3}{dt} = \frac{c_{G3}^2}{g_0} \frac{d\rho_{G3}}{dt} + \frac{\dot{m}_3(h_{L3} - h_{G3})(\gamma - 1)}{v_{G3} - bM_{G3}}.$$
 (75)

Note the gas phase equation is no longer affected directly by the liquid injection into the chamber, but by the rate at which the liquid is turned into gas. Now we define the speed of sound in the mixture by the equation

$$\frac{1}{\rho_{3}c_{3}} = \frac{\epsilon_{3}}{\rho_{G3}c_{G3}} + \frac{(1 - \epsilon_{3})}{\rho_{L3}c_{L3}}$$
(76)

or

$$c_{3} = \sqrt{\frac{1}{\rho_{3}} \left[ \frac{1}{\epsilon_{3}/(\rho_{G3} c_{G3}^{2}) + (1 - \epsilon_{3})/(\rho_{L3} c_{L3}^{2})} \right]}.$$
 (77)

Combining eq. (74) and (75), and using eq. (76), the result is

[8] 
$$\frac{dp_{3}}{dt} = \frac{\rho_{3}}{g_{o}} \frac{c_{3}^{2}}{v_{3}^{2}} \left\{ -\frac{dv_{3}}{dt} + \frac{\mathring{m}_{13}}{\rho_{L3}} + \frac{\mathring{m}_{23}}{\rho_{L3}} \right\} + \frac{\mathring{m}_{3}}{\rho_{G3}} \left[ 1 - \frac{\rho_{G3}}{\rho_{L3}} + \frac{g_{o}}{c_{G3}} \frac{(h_{L3} - h_{G3})(\gamma - 1)}{(1 - b\rho_{G3})} - \frac{\mathring{m}_{34}}{\rho_{3}} \right\}.$$
 (78)

Now consider region 4. The mass conservation equations are

$$\frac{dM_{L4}}{dt} = \frac{M_{L3}}{M_3} \, \dot{m}_{34} - \dot{m}_4 \tag{79}$$

$$\frac{dM_{G4}}{dt} = \frac{M_{G3}}{M_3} \, \dot{m}_{34} + \dot{m}_4 \tag{80}$$

or expanding as before

$$-\frac{d\rho_{L4}}{dt} (1 - \varepsilon_4) V_4 - \rho_{L4} V_4 \frac{d\varepsilon_4}{dt}$$
(81)

+ 
$$\rho_{L4}$$
 (1 -  $\epsilon_4$ )  $\frac{dV_4}{dt} = \frac{M_{L3}}{M_3} \dot{m}_{34} - \dot{m}_4$ 

$$\frac{d\rho_{G4}}{dt} \epsilon_4 V_4 + \rho_{G4} V_4 \frac{d\epsilon_4}{dt} + \rho_{G4} \epsilon_4 \frac{dV_4}{dt} = \frac{M_{G3}}{M_3} \dot{m}_{34} + \dot{m}_4.$$
 (82)

Again we assume that the gas and liquid pressures in the region are identical. Then the pressure equations are

$$\frac{\mathrm{d}p_4}{\mathrm{d}t} = \frac{c_{\mathrm{L}4}^2}{\mathrm{g}_0} \frac{\mathrm{d}\rho_{\mathrm{L}4}}{\mathrm{d}t} \tag{83}$$

and

$$\frac{dp_4}{dt} = \frac{c_{G4}^2}{g_0} \frac{d\rho_{G4}}{dt} + \frac{\dot{m}_4(h_{L4} - h_{G4})(\gamma - 1)}{v_{G4} - bM_{G4}}$$
(84)

$$+ \frac{{}^{M}_{G3}}{{}^{M}_{3}} \frac{{}^{4}_{34}({}^{6}_{G3} - {}^{6}_{G4})(\gamma - 1)}{{}^{7}_{G4} - {}^{6}_{M}_{G4}}.$$

Note that the mixture in region 3 is assumed to be homogeneous, and the fluid that flows into region 4 has the same porosity as the fluid in region 3. In general, region 4 has a different porosity. So the gas phase

pressure equation for region 4 has to include the effect of that portion of the mixture in region 3 that is gas. Combining the equations as before

[13] 
$$\frac{dp_{4}}{dt} = \frac{\rho_{4} c_{4}^{2}}{g_{o} V_{4}} \left\{ -\frac{dV_{4}}{dt} + \frac{\dot{m}_{4}}{\rho_{G4}} \left[ 1 - \frac{\rho_{G4}}{\rho_{L4}} + \frac{g_{o}(h_{L4} - h_{G4})(\gamma - 1)}{c_{G4}^{2}(1 - b\rho_{G4})} \right] + \frac{\dot{m}_{34}}{\rho_{G4} M_{3}} \left[ M_{G3} + M_{L3} \frac{\rho_{G4}}{\rho_{L4}} + \frac{g_{o} M_{G3} (h_{L3} - h_{L4})(\gamma - 1)}{c_{G4}^{2}(1 - b\rho_{G4})} \right] \right\}.$$
(85)

To complete the system, equations are required to determine the liquid density and mass in the regions. The corresponding gas quantities can be easily derived. The liquid pressure equations (74) and (83) are rewritten as

[14] 
$$\frac{d\rho_{L3}}{dt} = \frac{g_0}{c_{L3}} \frac{dp_3}{dt}$$
 (86)

and

[16] 
$$\frac{d\rho_{L3}}{dt} = \frac{g_0}{c_{L4}^2} \frac{dp_4}{dt} . \tag{87}$$

The mass conservation equations for the liquid are written as

[15] 
$$\frac{dM_{L3}}{dt} = \dot{m}_{13} - \frac{M_{L3}}{M_3} \dot{m}_{34} - \dot{m}_{3}$$
 (88)

and

[17] 
$$\frac{dM_{L4}}{dt} = \frac{M_{L3}}{M_3} \dot{m}_{34} - \dot{m}_4 . \tag{89}$$

To close the system, we need information on the rate at which the liquid droplets are combusting. The rate of surface regression is assumed to be of the form

rate of surface regression = 
$$A p^{B}$$
. (90)

Liquid propellant burning rates have been measured by McBratney. 15 16 The rate of burning

$$\dot{m}_3 = \rho_{L3} S A \rho_3^B$$
, (91)

where S is the total surface area of the droplets in a region. All the droplets are assumed to have a constant diameter d.

The surface area of a single drop is given by

$$S_{D} = \pi d^{2} . ag{92}$$

and the volume of a single drop by

$$V_{\rm D} = \frac{\pi}{6} d^3$$
 (93)

 $<sup>^{15}\</sup>text{W.F.}$  McBratney, "Windowed Chamber Investigation of the Burning Rate of Liquid Monopropellants for Guns," ARBRL-MR-03018, April 1980.

<sup>16</sup>W.F. McBratney, "Burning Rate Data, LPG 1845," ARBRL-MR-03128, August 1981.

If  ${\rm N}_{\rm D}$  is the total number of drops in region 3, then

$$N_{D} = V_{L3}/V_{D} . (94)$$

So the total surface area in the region

$$S = 6V_{L3}/d \tag{95}$$

and eq. (91) can be written as

$$\dot{m}_3 = \rho_{L3} \ V_{L3} \ \frac{6}{d} \ A \rho_3^{\ B} \tag{96}$$

or

$$\mathring{\mathbf{m}}_{3} = \mathcal{M}_{L3} \frac{6}{d} \operatorname{Ap}_{3}^{B} . \tag{97}$$

For region 4, the pressure is no longer constant over the region, but follows the Lagrange pressure distribution. But this would be quite complicated to keep track of, and very little liquid goes into region 4 for most problems. So the combustion rate is assumed to depend on the average pressure  $P_4$ , and

$$\dot{m}_4 = M_{L4} \frac{6}{d} A p_4^B . (98)$$

## C. DROP 3

The above representation assumes that all the droplets remain the same size at all locations and times. In practice, some distribution of droplets will exist as a function of space and time. In this section, we present a slight generalization of the above model.

The drops still form instantaneously as the fluid enters the combustion chamber, and all the droplets are initially the same size. However, the droplets will shrink as they burn. They will be represented by an approximation to a probability distribution. One advantage is that different probability distributions can be easily implemented using the formalism developed below. So alternate theories of droplet formation and combustion can easily be added.

A standard procedure is to define a probability distribution function f(r) = the probable number of droplets with radius between r and r + dr. For our purposes it is more convenient to use the mass of the droplets rather than the number of droplets. So define M(r) = the mass of the droplets in region 3 with diameter between r and r + dr. Since this is a lumped parameter region, there is no space dependency. Then let m(r) be the rate of consumption of drops with radius r, or

$$\dot{m}(r) = M(r) \frac{3}{r} A p_3^B$$
 (99)

Then we have the partial differential equation

$$\frac{\partial M(r)}{\partial t} = -\frac{M(r)}{M_3} \mathring{m}_{34} - \mathring{m}(r) + \frac{\partial M(r)}{\partial r} \frac{\partial r}{\partial t}. \qquad (100)$$

<sup>&</sup>lt;sup>17</sup>F.A. Williams, "Progress in Spray-Combustion Analysis," in The Eighth International Combustion Symposium, Williams and Wilkins Co., Baltimore, MD, 1962.

The first term is the loss term to region 4, the second term is the loss term to the gas phase, and the last term is the loss to smaller drops. There is also an input boundary condition for  $r = initial\ radius$  of the droplets and an output boundary condition at r = 0.

Rather then solve the above partial differential equation, the distribution is discretized to obtain a set of ordinary differential equations. To be consistent with the previous notation, the diameter rather than the radius of the droplets will be used. More or less arbitrarily, the distribution is split into ten classes. Let  $d_{\rm init}$  = the initial diameter of the droplets and  $d_{\rm inc}$  =  $d_{\rm init}/10$  be the difference in diameter of the ten droplet classes. Then define  $M_{\rm L3}(i)$  = the mass of the droplets with diameter between  $d_{\rm init}$  - (i) $d_{\rm inc}$  and  $d_{\rm init}$  - (i+1) $d_{\rm inc}$ . Then let  $d_{\rm init}$  = (1.05 - 0.1i) $d_{\rm init}$  be the working diameter for each class of droplets. That is, for purposes of obtaining burning rates, assume that this is the diameter of all droplets in the class. Then

$$\dot{m}_3(i) = M_{L3}(i) \frac{6}{d_i} Ap_3^B$$
 (101)

is the mass burning rate for each class, and

$$\dot{m}_{3} = \sum_{i=1}^{5} \dot{m}_{3}(i) \tag{102}$$

is the total mass burning rate.

To derive the governing ordinary differential equations, assume that in any class, the mass is evenly distributed among the possible diameters. This will contradict the assumption above that all the droplets have an average diameter. But in the limit of infinitely many classes, it will be equivalent. Looking at the first class,

$$\Delta M_{L3}(1) = \dot{m}_{13} \Delta t - \frac{M_{L3}(1)}{M_3} \dot{m}_{34} \Delta t - \dot{m}_3(1) \Delta t - M_{L3}(1) \Delta d/d_{inc}$$
 (103)

or the change in mass of class l = influx into region 3 - efflux to region 4 - loss to the gas phase - loss to the next smaller class. Since we assume that the mass is equally distributed over the possible diameters,  $\Delta d/d_{\mbox{inc}}$  of the mass will shrink into the next smaller class. Taking the limit

[18] 
$$\frac{dM_{L3}^{(1)}}{dt} = \dot{m}_{13} - \frac{M_{L3}^{(1)}}{M_3} \dot{m}_{34} - \dot{m}_{3}^{(1)} - \frac{M_{L3}^{(1)}}{d_{inc}} 2Ap_3^B.$$
 (104)

Note that the rate of change of the diameter = twice the surface regression rate =  $2Ap_3^B$ . Since we assume that all the droplets initially start in class one, all the influx from region 1 goes into class 1. For the other classes, the equations are

[19-27] 
$$\frac{dM_{L3}(i)}{-dt} = -\frac{M_{L3}(i)}{M_3} \dot{m}_{34} - \dot{m}_{3}(i)$$
 (105)

+ 
$$\frac{M_{L3}(i-1) - M_{L3}(i)}{d_{inc}}$$
 2Ap<sub>3</sub><sup>B</sup>,  $i = 2$  ...10.

All the earlier equations [1] to [17] from the above section are the same, except for the new definition of  $\mathring{\mathbf{m}}_3$  and the corresponding definition of  $\mathring{\mathbf{m}}_4$ . One of the equations in (105) is in fact redundant, since  $\mathbf{M}_{L3} = \mathbf{M}_{L3}(1) + \ldots \mathbf{M}_{L3}(10)$ . The extra equation is included for the sake of simplicity.

The equations for region 4 are similar, except that there is no source term from region 1. The loss terms for region 3 are the source terms for

region 4. That is,

[28-37] 
$$\frac{dM_{L_4}(i)}{dt} = \frac{M_{L_3}(i)}{M_3} \dot{m}_{34} - \dot{m}_4(i)$$

$$- \frac{M_{L_4}(i)}{d_{inc}} 2Ap_4^B \quad i = 1 \dots 10.$$
(106)

### VI. MASS AND ENERGY BALANCE

As a check on the equations derived, both mass and energy should be conserved. The mass balance is straightforward.

$$M_{T} = M_{1} + M_{3} + M_{4} \tag{107}$$

where  $\mathbf{M}_{T}$  is the total mass of the propellant and primer. This should be constant throughout the integration.

The energy balance is more complicated. The energy loss through friction is quite small, and is ignored. The code presently does not include heat loss or air resistance. The liquid is considered to be an isothermal fluid, and its internal energy e is just the chemical energy of the propellant. The total energy of the liquid is

$$E_1 = e_1(M_1 + M_{L3} + M_{L4}) . (108)$$

The internal energy of the gas in region 3 is given by

$$e_3 = c_v T_3 \tag{109}$$

and the total gas energy is

$$E_3 = c_v T_3 M_{G3}$$
 (110)

The average internal energy of the gas in region 4 is given by

$$e_4 = \frac{1}{x_R} \int_0^{x_R} c_v T_4 dx$$
 (111)

or

$$e_4 = \frac{1}{x_R} \int_0^{x_R} \frac{p(x)(1 - b\rho_4)}{\rho_4(\gamma - 1)} dx$$
 (112)

by the Noble-Abel equation. Using eq. (38) for the pressure function, this can be integrated to yield

$$e_4 = \frac{(1 - b\rho_4)}{\rho_4(\gamma - 1)} p_4 \tag{113}$$

and

$$E_4 = e_4 M_{G4} . \tag{114}$$

The kinetic energy of the piston is given by

$$EK_{ps} = 0.5M_{ps} V_{ps}^{2}/g_{o}$$
 (115)

and the kinetic energy of the projectile by

$$EK_{pj} = 0.5M_{pj} v_{pj}^{2}/g_{o}.$$
 (116)

By our assumptions, only the fluid in region 4 is moving. The kinetic energy of the gas is

$$EK_{G4} = \int_{0}^{x_{R}} 0.5 \rho_{G4} A_{4} v^{2}/g_{o} dx . \qquad (117)$$

We ignore drag and assume that the liquid has the same velocity as the gas. Then the kinetic energy of the liquid is

$$EK_{L4} = \int_{0}^{x_{R}} 0.5 \rho_{L4} A_{4} v^{2}/g_{o} dx . \qquad (118)$$

The Lagrange pressure distribution implies a linear velocity profile with the gas velocity at the tube entrance equal to zero. This implies that

$$v = V_{pj} x/x_{R} . (119)$$

Substituting and integrating

$$EK_{G4} = 0.5 M_{G4} V_{pj}^{2} x_{R}/(3g_{o})$$
 (120)

and

$$EK_{L4} = 0.5 M_{L4} V_{pj}^{2} x_{R}/(3g_{o}). \qquad (121)$$

Then the total energy of the system is

$$E_T = E_1 + E_3 + E_4 + E_{ps} + E_{pj} + E_{G4} + E_{L4}.$$
 (122)

This should be constant throughout the integration.

#### VII. NUMERICAL METHOD

The ordinary differential equations derived above are solved using the code EPISODE. 18 This is a robust and efficient code for the solution of ordinary differential equations. EPISODE proper consists of the subroutines DRIVE to SING (see Appendix A).

Only two changes have been made in EPISODE proper. The first concerns the error control. Originally this could be either a relative or an absolute error control. A relative error control can be wasteful if some of the quantities being integrated become negligibly small. However, an absolute error control is inaccurate if the quantities integrated vary widely in magnitude.

A solution to this problem was developed during work on integrating chemical kinetics networks, where the concentrations of species differ by many orders of magnitude.  $^{19}$  This is a semi-relative error control. If the quantities are above some cutoff value (SREC) a relative error control is used. If they are below SREC, an absolute error control is used. While an absolute error control would be adequate for the simpler equations now being considered, the semi-relative error control has been left in the code. SREC has normally been chosen as  $10^{-6}$ .

The other change is at the end of the routine TSTEP, which actually takes the integration steps. Several options have been included here. First, diagnostic printouts of the quantities of interest may be made after

<sup>&</sup>lt;sup>18</sup>A.C. Hindmarsh and G.D. Byrne, "EPISODE: An Effective Package for the Integration of Systems of Ordinary Differential Equations," UCID-30112-Rev.l, Lawrence Livermore Laboratory, 1977.

<sup>&</sup>lt;sup>19</sup>T.P. Coffee, "A Computer Code for the Solution of the Equations Governing a Laminar, Premixed, One-Dimensional Flame," ARBRL-MR-03165, April 1982.

each time step (KWRITE=1). Second, if the optimum gun option is being used (VENT 2), the vent area is updated at the end of each time step. Finally, some information about regions 1 and 4 must be included. Eq. [4] for the liquid density becomes singular as  $V_1$  approaches zero. So when  $V_1$  becomes some fraction VPER of the initial volume, the region is closed. That is, region 1 is ignored in the integration from then on. This will lead to a small error, due to the liquid propellant left in region 1 when the region is closed. However, VPER is an input parameter, and by trial and error can be chosen small enough that the error is negligible. If  $V_1$  ever becomes negative, the step is rejected, and the integration starts again with a smaller time step. There is a similar problem with region 4, since the projectile may start at the throat, and  $V_4$  will be zero. So region 4 starts out as closed. When the projectile is at least .01 cm. down the gun tube, the region is opened. Before this, region 4 is considered as an extension of region 3.

There are actually two integration routines included in EPISODE. The first is the Adams method, suitable for non-stiff problems (METH=1). The second is the backward differentiation method, suitable for stiff problems (METH=2). We have normally used METH=2. However, the governing equations are not very stiff, and METH=1 can also be used. The run times are about equivalent for the two methods.

There are also several methods for the solution of the nonlinear system of equations required at each step of the integration. We have used the Newton method with an internally computed finite difference approximation to the Jacobian. So the only subroutine that needs to be supplied by the user is DIFFUN. Given a set of values for the unknowns, DIFFUN computes the time derivatives of the unknowns.

Na Secretar Beecling Internet Assistant Consists and Assistant Consists Andread

Subroutine DIFFUN in this code only calls one of three subroutines (FDROP1, FDROP2, or FDROP3). These routines correspond to the instantaneous burning option, the fixed drop size option, and the shrinking drop size option. Since the governing equations are different, it is easier to set these up as separate subroutines.

The rest of the routines have to do primarily with input and output. The main routine RLGD read in the input data, sets the initial conditions, calls the integrator, and writes the main output file.

To make it easier to add or change options, some of the input is in separate subcoutines. For instance, subroutines VENT1, VENT2, and VENT3 read in the required data for the three vent options. These routines also compute the vent area for a given piston travel. So if a new vent option is desired, it is only necessary to add a new subroutine and change the few lines that call the VENT subroutines.

Similarly, DROP2 and DROP3 read in the input parameters for the droplet options. PISRES reads in the piston resistance as a function of piston travel. DIS1 and DIS2 read in the discharge coefficients. These can be either a function of piston travel or a function of liquid pressure. PROJRES reads in the projectile resistance pressure as a function of projectile travel. Subroutine PRIM2 is a simple primer option. That is, the primer may be included as droplets in region 3 to follow the initial behavior of the system in more detail.

Subroutines CAPTION and OUT control the output files. Subroutine OUTGRA creates a graphics file, so that any of the quantities computed may later be graphed.

#### VIII. NUMERICAL COMPARISONS

As a check, we will compare our code with the numerical code developed by Gough.<sup>5</sup> The sample problem used is discussed in ref. [6]. This is a 25 mm. gun with a constant vent area. The input data required is reproduced in Table 1.

Table 1. Baseline Input Data for Test Problems.

fuel side area of piston	13.00	$cm^2$
combustion side area of piston	15.48	$cm^2$
gun tube area	4.91	cm <sup>2</sup>
initial fuel reservoir volume	96.00	$cm^3$
initial combustion chamber volume	35.40	cm <sup>3</sup>
initial projectile offset in tube	1.27	cm
projectile travel	213.36	cm
projectile weight	194.40	gm
piston weight	480.82	gm
bore discharge coefficient	.95	
piston discharge coefficient	•58	
shot start pressure	36.00	MPa
liquid density (1 atm.)	1.23	gm/cm
bulk modulus	2413.10	MPa
liquid chemical energy	<b>3330.9</b> 0	joules/gm
ratio of specific heats	1.26	•
molecular weight of combustion gases	19.01	gm/mole
covolume	1.26	cm <sup>3</sup> /gm
initial liquid pressure	•10	MPa
initial gas pressure	81.00	MPa

The answer given here for the Gough code are slightly different than those reported in ref. 6. The Gough code controls the integration time step size based on the grid in the gun tube. The time step must be small enough not to violate the Courant-Friedrich-Levy condition. The maximum number of grid points and the minimum grid spacing in the gun tube are input conditions. A smaller grid size than was used in ref. 6 was required to obtain convergence.

<sup>&</sup>lt;sup>20</sup>P.J. Roache, <u>Computational Fluid Dynamics</u>, Hermosa Publishers, 1972.

The results for these computations are given in Table 2. The agreement between the two codes is not very good.

Table 2. Comparison - Baseline Input Parameters.

	Gough	Coffee
Muzzle velocity (m/s)	1097	1161
Max. liquid pressure (MPa)	289	351
Max. combustion pressure (MPa)	231	277
Time until projectile exit (ms)	3.7	3.2
Computer time (s)	20.6	1.2

This can be partially explained by considering the way the Gough code computes the mass flux between the liquid chamber and the combustion chamber. If the combustion chamber pressure is higher, gas can flow into the liquid chamber. Since the liquid chamber is one phase, the code converts this into liquid, which defies conventional physics. The new code normally does not allow flow into the liquid chamber. However, it can be run with this option. The results are in Table 3.

Table 3. Comparison - Back Flow into Liquid Chamber.

	Gough	Coffee
Muzzle velocity (m/s)	1097	1140
Max. liquid pressure (MPa)	289	316
Max. combustion pressure (MPa)	231	251
Time until projectile exit (ms)	3.7	3.4
Computer time (s)	20.6	0.7

The agreement is better, but there are still noticeable differences. Another possible cause for error is the time step control in the Gough code, which is based solely on the conditions in the gun tube. However, in the present problem we are starting with a large pressure difference between the combustion chamber and the liquid reservoir. The time step must be reduced to resolve the interaction between these two chambers and the piston movement.

To check this hypothesis, the initial pressure conditions were changed to initial liquid pressure = 9 MPa and initial gas pressure = 10 MPa. This is less of a strain on the error control. As Table 3 shows, the two codes now give almost identical answers.

Table 4. Comparison - Initial Gas Pressure = 10 MPa.

	Gough	Coffee
Muzzle velocity (m/s)	1114	1133
Max. liquid pressure (MPa)	311	310
Max. combustion pressure (MPa)	247	247
Time until projectile exit (ms)	4.2	4.2
Computer time (s)	23.5	2.5

The only noticeable difference is in the muzzle velocity. The difference is in the expected direction. That is, the new code assumes a Lagrange pressure distribution in the gun tube. So any changes in pressure in the combustion chamber instantaneously effect the projectile, no matter how far down the gun tube it is located. The Gough code uses partial differential equations to describe the gun tube, and actually follows the pressure waves as they propagate. So there is a delay between the pressure rise in the combustion chamber and the corresponding pressure rise at the base of the projectile. This results in a slightly lower muzzle velocity.

Fig. 3 compares the combustion chamber pressures as a function of time, and fig. 4 compares the projectile velocities. These curves confirm the above analysis. The agreement is excellent at early times. But as the projectile moves down the gun tube, differences appear and become greater with time.

It is useful to know if these differences can become important. So we took the previous problem and increased the liquid reservoir volume to 300 cm and the projectile travel to 1000 cm. Results are given in Table 5 and in figs. 5 and 6. There is in fact a fairly large difference in muzzle velocities.

Table 5. Comparison - Long Gun Tube.

	Gough	Coffee
Muzzle velocity (m/s)	1556	1685
Max. liquid pressure (MPa)	264	261
Max. combustion pressure (MPa)	205	203
Time until projectile exit (ms)	10.0	10.2
Computer time (s)	32.8	2.4

In conclusion, the Gough code may be inaccurate if the mechanisms controlling the time step occur in the lumped parameter regions. The new code, however, will overpredict the muzzle velocity for a long gun tube. It may also be inaccurate for a high performance (large muzzle velocity) gun, if the projectile moves fast enough that the pressure increase in the throat of the gun tube cannot catch the projectile. The new code runs about 10 to 15 times faster than the Gough code. Several other comparisons have been made, and the above conclusions still hold.

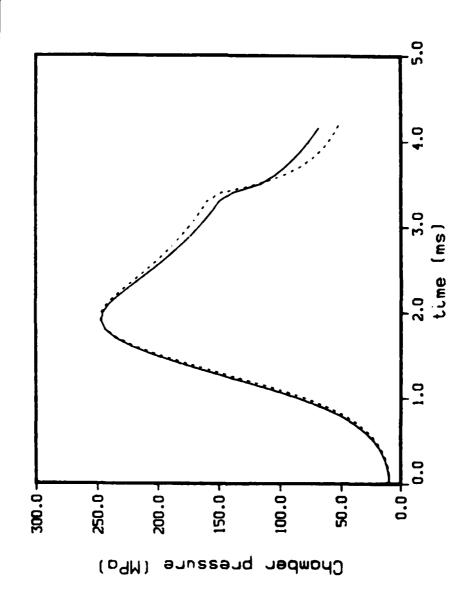


Figure 3. Baseline 25 mm Gun - Instantaneous Combustion - Initial Chamber Pressure = 10 MPa. - Chamber Pressures. Coffee model (line); Gough model (dot)

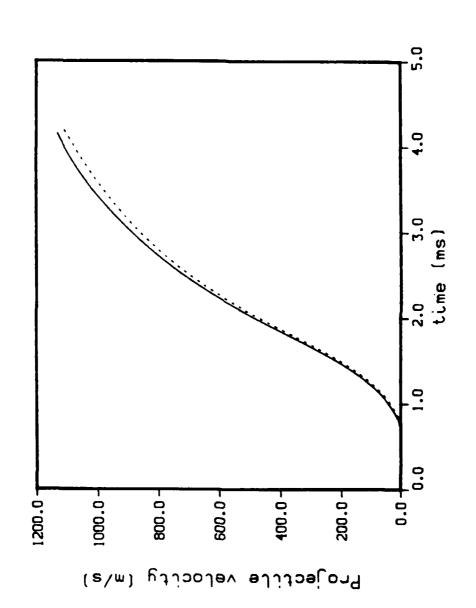


Figure 4. Baseline 25 mm Gun - Instantaneous Combustion - Initial Chamber Pressure = 10 MPa. - Projectile Velocities. Coffee model (line); Gough model (dot)

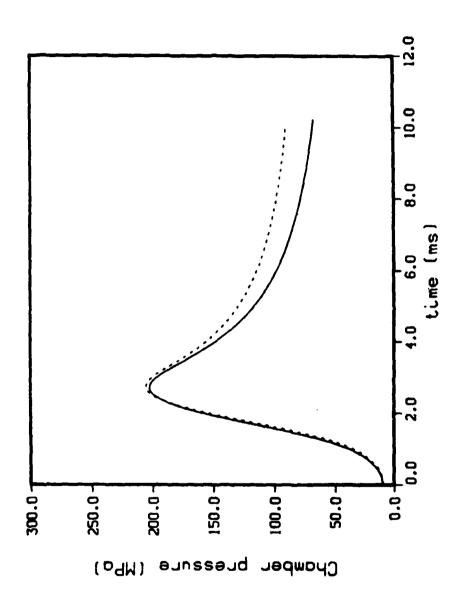


Figure 5. Long 25 mm Gun - Instantaneous Combustion - Initial Chamber Pressure = 10 MPa. - Chamber Pressures. Coffee model (line); Gough model (dot)

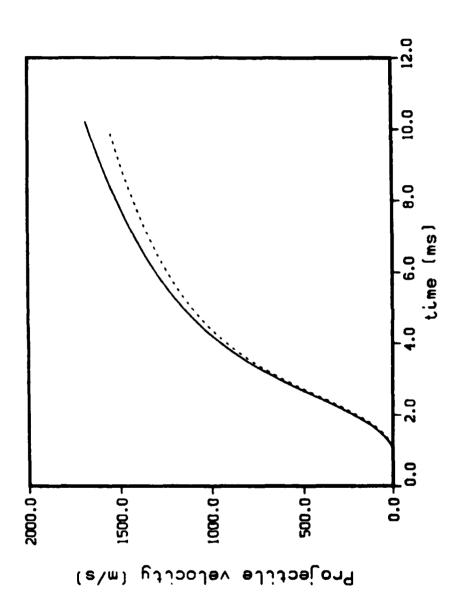


Figure 6. Long 25 mm Gun - Instantaneous Combustion - Initial Chamber Pressure = 10 MPa. - Projectile Velocities. Coffee model (line); Gough model (dot)

#### REFERENCES

- 1. W.F. Morrison, J.D. Knapton, and G. Klingenberg, "Liquid Propellants for Gun Applications," Proceedings of the Seventh International Symposium on Ballistics, The Hague, The Netherlands, April 1983.
- 2. P.G. Baer, "Practical Interior Ballistic Analysis of Guns," Progress in Astronautics and Aeronautics, <u>Interior Ballistics of Guns</u>, (H. Krier and M. Summerfield, ed.), Vol. 66, 1979.
- 3. G. Pagan and D.C.A. Izod, "Regenerative Liquid Propellant Gun Modelling," Proceedings of the Seventh International Symposium on Ballistics, The Hague, The Netherlands, April 1983.
- 4. P.G. Cushman, "Regenerative Liquid Propellant Gun Simulation User's Manual," GE Report 84-POD-004, December 1983.
- P.S. Gough, "A Model of the Interior Ballistics of Hybrid Liquid-Propellant Guns," Final Report, Contract DAAK11-82-C-0154, PGA-TR-83-4, September 1983.
- 6. W.F. Morrison, M.J. Bulman, P.G.Baer, and C.F. Banz, "The Interior Ballistics of Regenerative Liquid Propellant Guns," 1984 JANNAF Propulsion Meeting, New Orleans, LA, CPIA Publication 390, February 1984.
- 7. P. G. Baer, C.F. Banz, I.W. May and W.F. Morrison, "A Propulsion System Comparison Study for the 120-MM Anti-Armor Cannon," 1984 JANNAF Propulsion Meeting, New Orleans, LA, CPIA Publication 390, February 1984.
- 8. J. Corner, Theory of the Interior Ballistics of Guns, Wiley, New York, 1950.
- 9. W.F. Hughes and J.A. Brighton, <u>Fluid Dynamics</u>, Schaum's Outline Series, McGraw-Hill, New York, 1967.
- 10. W. Kaufman, Fluid Mechanics, McGraw-Hill, New York, 1963.
- 11. R.W. Fox and A.T. McDonald, Introduction to Fluid Mechanics, 2nd ed., John Wiley and Sons, NY, 1978.
- 12. W. Band, Introduction to Mathematical Physics, D. Van Nostrand Company, Princeton, NJ, 1960.
- 13. G.N. Lewis and M. Randall, <u>Thermodynamics</u>, McGraw-Hill, New York, 1961.
- 14. R.B. Bird, W.E. Stewart, and R.B. Bird, <u>Transport Phenomena</u>, John Wiley and Sons, New York, 1960.
- 15. W.F. McBratney, "Windowed Chamber Investigation of the Burning Rate of Liquid Monopropellants for Guns," ARBRL-MR-03018, April 1980.

- 16. W.F. McBratney, "Burning Rate Data, LPG 1845," ARBRL-MR- 03128, August 1981.
- 17. F.A. Williams, "Progress in Spray-Combustion Analysis," in The Eighth International Combustion Symposium, Williams and Wilkins Co., Baltimore, MD, 1962.
- 18. A.C. Hindmarsh and G.D. Byrne, "EPISODE: An Effective Package for the Integration of Systems of Ordinary Differential Equations," UCID-30112-Rev.1, Lawrence Livermore Laboratory, 1977.
- 19. T.P. Coffee, "A Computer Code for the Solution of the Equations Governing a Laminar, Premixed, One-Dimensional Flame," ARBRL-MR-03165, April 1982.

ship, whiches, wester indicate, recision recipion scores, bereshed thereas series freezested as

20. P.J. Roache, Computational Fluid Dynamics, Hermosa Publishers, 1972.

# APPENDIX A

A listing of the computer code follows. Routines RLGD to PEDERV have been written for the regenerative liquid gun application. Routines DRIVE to SING comprise the code EDISODE.

	POOGRAM PLSD 74/76 OPT=1 POUND=/ TRACF FTN 4.8+601	02/22/A5	13
•	THE PROPERTY OF THE PROPERTY O		
-	TABLE A TABLE ATTACHE	00000	
	* INTERNATIONAL TANGET AND THE CONTRACT OF THE	02100	
		0.1000	
٠		041000	
r		05100	
	C RICHIADA 19. 1966.	091000	
		0011000	
	CAD IL NOTULEIO	000140	
-	COMMON/EPCONS/HESES-NOUSES-NOTES-NAT	001000	
•	COMMON/TABL/GO, GAM, COV, ENER, OFF SFT	002000	
	COMMON/TARS/BK1.+FK2.+RM11.+VDER	000510	
	COMMON/TARG/DC.AVE:1T.A1.A3.A4.AMOLE.VCOP	000250	
	COMMON/TAB&/PSWT*PSTRAV*MOD1*48ACK*MOD4	000530	
15	COMMON/TARS/C3,C4.RMD13,RMD34,RMD4,RM1,PM3,RM4,PM5UM,RM1NT	000240	
	COMMON/TABA/V1.4PS.5PS.PH1.P1.V3.RH3.P3.V4.VPJ.SPJ.P4.P4.P4	000220	
	COMMON/TART/PUMT TRAVEL	092000	
	COMMOL/TABA/PSPS.PL.PR.DC34	000570	
	COMMON/TAGO/EL1.EG3.EG4.EKPS.EKPJ.FKG4.ESUM.EINT	062000	
20	COMMON/TAR10/PII+WG+QS+CP+CV+TE4P3+TE4P4+HL1+HL3+ML4+H3+H4	002000	
	COMMON/TABII/LSKIP+LPAGE.TMS.PMAX(10)	000300	
	COMPON/TAR12/MVENT.NVENT.AVMIN.AVMAX.AK.ACS	000310	
	COMMONITARIJ/DI	026000	
	COMMON/TAR14/10P+ADH+BDR	066000	
2,	COMMON/TAB15/CL1,CL3,CG3,CL4,CG4,PMG3,PML3,PMG4,PML4	000340	
	COMMON/TA916/RHG3.RHL3.PHG4.PHL4.EL3.EL4.EKL4	000320	
	COMMON/TAR17/VG3.VL3.VG4.EPS3.EPS4	000340	
	COMMON/TABLA/DINC.PDDP(10).PML3(10).PML4(10).PML4(10).PMC4(10)	000370	
	COMMON/TAR19/SIGMA.U13.WE	081000	
30	COMMON/TABINI/KWRITE·KOUTD·SREC·TITLE(8)·TVENT(8)·TDROP(8)·TDIS(4)000390	4)000340	
ı	TAINT TOTAL	000400	
	DATA PI/3.141592654/	000410	
		000450	
		000430	
35	ALL INPUT DATA IS READ IN HERE (TAPE 5).	000440	
		000420	
	C GRAPHICS INFORMATION IS PRINTED ON TAPEIT.	000460	
		000470	
	•	0004100	
Ç			
	C READ IN THE INDICT.		
	FOR STATE OF	000000	
		055000	
ų	2 ATTENDED TO THE PROPERTY OF	000540	
<b>*</b>		000220	
		000000	
		000210	
		000500	
ď		065000	
:	29 FOUND (2x-72at)	004000	
		019000	
		029000	
	REAN (5-10) NFFCFT - 12 VEL	064006	
r r	#014F(4.100)OFFSFT.FunvFL	000440	
	FEAF(5+10) P4+0C34	00000	
	B643-14150250060166/6.0	00000	

	სეში ზოდესძძ	76/75	98/22/20
	3	48 [TE (6.115) 04.24	000670
	3	34	000400
A.0	ā	PEAD(5.10)PJWT	000400
	ā	PEAN(5+10)PS4T	000100
	<b>3</b>	WRITE(5.140)PJWT.PSWT	000710
		PERC (St. 15) FREACK	000120
1	<b>–</b>	(MIRACK, ED. 1) WOITE (1.1) 47 MIRACK	000130
4.5		(FRACK-FO-0) ERITE (S-140) JEACK	000140
	or :	PEAR(5,10)VII.V3I	000750
	Ĭ		000740
	<b>■</b> 0	WW ITE (5+130) VII+V3I+V7E	000110
ç	1		04.000
10	<b>=</b> 7		00000
	<b>1</b>		
	i d	14 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	016000
	e c	かこまだ ほんごと 一(き・) マインリン	025000
ļ	r 7		05.000
2	7		
		AFER INTELLEGIOUS CONTRACTOR CONT	
	, unco	ODITOR ACCUMENT ACTION ODITOR OF THE TARK ACTION OF THE TARK THE TARK TO THE TARK TH	0000
		TOWN TOWN TOWN	C 41000
6		THE A LATE	00000
ř		TOTAL	
	<b>e</b> 3	ARK CANADA ARK	
			025000
,	CESTIN	COMBUSTOR	066000
A.S	'n	2.25-LENGTH LIQUID CHAMBER + LENGTH COMPUSTION CHAMBER	00000
	•	PISTON THICKNESS (5.4 CM) + END PLATE (10.2 CM).	900020
	ธ	CLEN=2.25+PSTPAV+V3I/A3+5.4+10.2	000000
		WPITE(6.161)CLEN	000010
	C PIST	PISTON RESISTANCE TABLE.	066000
00		CALL PISPES(1,0,0,PSPS)	066000
	C DISC	DISCHAPGE COEFFICIFNI TAPLE	00100
	ã	READ (5,2) TOIS	01,100
	3	158) TDIS	00100
	c 01sc	A FUNCTION	001030
ę.	Ē	)CALL 0151(1)	00100
	c pisc		001020
		(TDIS(1), En. 10HDIS2 ) CALL DIS2(1)	00100
	PROPE O	PROJECTILE PESISTANCE TAGLE.	001010
	ΰ'	CALL PROJRES(1+0.0+PJRS)	001090
901	<b>~</b>	READ (5,10) BHIT - HKI-HKZ	062100
	<b>3</b>	BRITE (6+155) RELITERAL TERA	001100
		AFRA (S.10) ENERGENERAL	001110
	3	##   Tr ( (+ 200 )   Nr ( + 200 )	021100
!		PEAD (5-10) STSMA	061100
105	*	WDITF (6,202) STORM	001100
	Č :	READ (5.10) 4G-COV	001150
	3	WITTE (50.205) WG.COV	
	2		
:	1	TAILURA CONTRACTOR TO THE CONTRACTOR OF THE CONT	000
61			001700
	SPECI	SPECIFIC SAC CLARACT	001210
		に こうしょう こうしょうしゅ ひろん こうしょうしゅうしゅうしゅうしゅうしゅうしゅうしゅうしゅうしゅうしゅうしゅうしゅう しゅうしゅうしゅう しゅうしゅう しゅうしゅうしゅう しゅうしゅうしゅう しゅうしゅうしゅうしゅうしゅうしゅうしゅうしゅうしゅうしゅうしゅうしゅうしゅうし	00150
	C SPECI	SPECIFIC HEAT OF THE GAS (CONSTANT VOLUME).	001230

	PROGRAM RLGD 76/76 APT=1 90UND=+-0/ TRACE FIN 4.8+401	02/22/85	13.15.44
115	CV=PS/(GAM-1.0)	001240	
	T OF THE GAS (CONSTANT PRESSIBE)	001250	
		001250	
	SMITE (601 Z5)	061210	
•	27.47 1 3.4	042100	
<u> </u>	TATE (Sec ) TO SEC TO SECTION SEC TO SECTION SEC TO SECTION SEC TO SECTION SEC TO SECT	062100	
	3218 TNATANCA A AFRICAGO C	001100	
		001320	
	RNING	001330	
125		001340	
		001350	
	IF TODIM = DDIMI. THEN PRIMES	001360	
		001310	
	C THE COMPUSTION CHAMBER IS AT ATMOSPHERIC PRESSURE.	062 700	
130	_	06100	
		00100	
	Ī	014100	
		024100	
		064100	
135	Z - 1 X - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 -		
	TIAN OF THE STANK S	004	
		0.7100	
	ファン・ファン・ファン・コン・コン・コン・コン・コン・コン・コン・コン・コン・コン・コン・コン・コン	044100	
9	0.1 - 1.0 -	00100	
	ないとし、このでは、このでは、このでは、このでは、このでは、このでは、このでは、このでは	001500	
		001510	
	IF (XVDITE FG. 1) AD ITE (6.186.) XVDITE	001520	
	10 FORMY (105E12-4)	001530	
5+1	12 FOGMAT(14,1P5E12,4)	001540	
	FORMAT(1014)	001550	
		001260	
	115 FORMAT (/5x, THPE DIAM #1, 1PE12.4,5x, THBE AREA #1, 1PE12.4)	001510	
		001580	
150	140 FORMAT(/SX.PUNT H **1PEI2.4.SX.PONT H**1PEI2.4)	001540	
		00100	
	TO THE TOTAL PROPERTY OF		
	•	00100	
25.5		001640	
	145 FORMAT(/SX**AREA FUEL =** IPE12*4*5X**AREA COMB =**1PE12*4)	001650	
	56 FORMAT(/SX. NDRIM = 1.14)	001560	
	60=1.0€7	001670	
	158 FORMAT (//Sx.RAID)	001680	
140		069100	
		001100	
	102 FOXFAT ( / NAV FOT STATEMENT   104 FOT STATEMENT   105 FOXFAT   10	001/10	
		067100	
145	170 FORMAT(/Sx. PPFS LIGUID =*   PF12.4.5x. PPFS GAS =*   PF12.4)	001740	
	FURMAT(/Sx. 'SDECIFIC GAS CONSTANT #1.1PE12.4)	001750	
		001740	
	r	001770	
		101740	
170	ď.	006.00	
	ZOO FORMAT (/SX. CHEM ENEMGY = [DE] Z.4.5x. GAM = [PE] Z.4.	111 <b>-1</b> 1.0	

AND CANADA CONTRACT C

	PROGRAM RLGS 76/74 OPT=1 ROUND=+-•/ TRACE FTN 4.8+501	02/22/85	13.
	202 FORWAT (/5x,*MML WI GAS x*, IPE12.4,5x,*COVOLIME x*, IPF12.4)	001410 . 001420	
175		001440	
	Y(1)=V1I C Y(2) IS THE PISTON VELOCITY.	001950	
1 40	VIOLETHE PISTON TRAVEL.	901300	
	Y(3)=0.0 C Y(4) IS THE LIGHTD DEHSITY AT THE GIVEN POFSSUPE.	001900	
	<pre>[F(RK2.F0.0.0) * (4) = PH][=EXP(PL]/RK]) [F(DK3.NF 0.0.0) * (4) = DH][=EXP(PL]/RK]</pre>	001920	
145	LIGUID PRESSURE.	001950	
	Y (5) = 17 Y (5) AND ENDERS VOLUME .	001050	
	Y(A) 187	001010	
9	C V(7) IS THE COMBUSTION CHAMBER OFISITY. BH1#DG1/FNFR+(GAR-1.0)+COV+DG1	001940	
•	Y (7) = PH3	00200	
	C *(A) [A THE COMPUSTION CHAMBER PRESSURF.	002010	
	12 CON	002030	
105	MOD4=1	002040	
	COFFSET.    Commonweal   Co	00000	
		002010	
	C Y(10) IS THE PROJECTILE VELOCITY	002040	
200	TIIO) BOOGCTILE TRAVEL	002100	
	Y(11)=0.0	002110	
	C TIZE IS THE TORE DENSITY	002130	
202	C Y(13) IS THE TURE PRESSURE	002140	
		041200	
	C Y(14) IS THE LIQUID DENSITY IN REGION 3.	002170	
;	Y(14)=Y(4)	002190	
612	1 12 12 12 12 12 12 12 12 12 12 12 12 12	002200	
	C Y(IA) IS THE LIQUID DENSITY IN REGION 4.	002210	
	TO NOTE THE CALL OF THE CALL O	062500	
215		002240	
	THIS SECTION ONLY FOR SMPINKING DROPLET MODEL.	002250	
		002270	
	C THESE ARE THE MASSES OF THE DROPLETS WITH DIAMETER PODR(1).	002290	
022		005200	
	6-08(I) k 652	002310	
	C IF PRIME OPTION 2. CHANGE THE INITIAL CONDITIONS.	902320	
325		005330	
:		002350	
	C SET THE TATEGRATOR DANA-ETERS. TRITORDELL FO. [DANA-ETERS]	002740 075200	

	PROGRAM PLGD 74/76 NPT=1 MOUND=+-*/ TGGE FTN 4.8-401	58/22/20	13
;	IF (TRBOP(1), EQ. 104DRQP2 ) H= 17	. 002380	
2		005400	
	7017=TIMC	014200	
	0 C T V L	002420	
215	1 FORDOR 2	002440	
	NOTIFIED IN	054200	
	₩FE#A	002460	
	7.15.0	002470	
240		069200	
,	LSKIP=0	002200	
	LPAGE*0	002510	
		005250	
245	GOD AMBACA) HO.O.O.A.A.AOOT)	002540	
	*EX*REGIRUS ICO	002550	
	CHEASSH (PAR + 40 KB +	002560	
	MATITY (6.225) MAIL-PRINCHARASS  JAT TA (6.225) MAIL-PRINCHARASS	07:200	
25.0	WILLIAM ST. 1	002590	
	DENSIL (PRI) + PRI) + P	002400	
	Wp17E(6.240) DENSL	002510	
	240 FORMAT(/5x, LOADING DENSITY =: , IPF12.4)	005550	
	MUZIFICAM	002430	
25.5		00000	
		00000	
	C CALC THE CAPACITY.	002470	
		002690	
240		002690	
	IF (INDEX.NE.0)STOP	002700	
	CALL DIFFUN(N,TOUT,Y,VDOT)	002710	
	TANKATCHILOOD.	027200	
265	TAIL TITLE OF THE PROPERTY OF	002740	
;	IF (1901) - EQ. 0. AND. VPJ. EQ. 0. 0. 0. 0. 10 550	002750	
	T0UT#T0UT+T1NC	002750	
		002770	
į	500 CONTINUE FORMER CONTINUE TO THE BROTHERT E LEAVING THE MIZZI E.	002780	
2/2	COMMESTOR IN TO		
	S.05 TOUTHOUTHOUTH	002910	
	CALL	002820	
	CALL DIFFUN(N.TOUT.Y.YDOT)	002A30	
275	IF(SPJ.GT.TRAVEL)69 TO 505	002840	
		002430	
	SIG TOTATIONS TO THE TRUBERS TRUBERS	002470	
		002840	
200	ο.	002430	
	TPS=TOUT+1000.	006200	
		016200	
	SAN CONTRACTOR	00000	
7	C CHANGE MIZZLE VELOCITY TO 4/5FC.	0.02940	

	PROGRAM PLSO	76/76	1 = 1	NPT=  MOUND=+=+/ TOACE	TOACE	FTN 4.8.401	58/52/50	13.15.44
		VM*VPJ/190.					002020	
	CEA	CHANGE MASS AND ENERGY EPPORS TO PERCENTAGES.	ENERGY	EPPORS TO P	EPCENTAGES.		096200	
		PMAX (6) = QMAX (6) - 100.	61-100				002910	
		PMAK (7) =RMAX (7) +100	71 *100				002940	
290		WP [ TF (6.590) VM	Į				00200	
		WPITE (6.500) RMAX(1)	MAX (1)				003000	
		WPITE (6+410) 9#AX (2)	WAX (2)				003010	
		WALTE (6,620) PMAX (3)	MAX(3)				020500	
		WRITE (6+630) PMAX (4)	MAX (4)				003030	
295		WPITE (6.640)9MAX (5)	MAX (5)				003040	
		WP [ TF (6.650) PMAX (6)	MAX (6)				003050	
		WPITF (6+660) PMAX (7)	MAX (7)				003460	
	290	FORMATITHISAX. MUZZLE VEL (M/SEC)	12 ZUM + 4.	E VEL (M/SE	C) **F10.1)		003070	
	9	FORMATI//5X,	MAX PI	) (MPA)	· F10.1)		003080	
300	910	FORMAT (/5X.	OMAX P3	3 (NPA)	·. F10.1)		060200	
	626	FORMAT (/5X.	× KM ·				001600	
	630	FORMAT (/5X.	. MAX	MAX PH (MPA)	F10.1)		003110	
	_	FORMAT (//SX.	× V V	ACC (K-6)	**F10.1)		003150	
	_	FORMAT (//5x .	XVII	MAX MASS ERROR	1.F10.2)		06 31 30	
305	640	FORMAT ( /5X .	YAM.	ENERGY ERRUR	**F10.2)		003140	
		GT = SECOND (CP)					003150	
	_	HT*GT-FT					003160	
		WP [ TF (6.575) HT.NSTEP	IT.NSTE				003170	
	475	FOPHAT (//5x .	RUN TI	E = 1, F12,1	FORMAT (//5x, PRIN TIME = 1,F12,1,5x, 1NSTFP = 1,1A)	14)	003140	
310		STOP					003100	
•		END					003500	

PAGE

SUARQUITINE VENT]	VENT	74/76	0PT=1 F	OPT=1 ROUND=+-*/ TRACE	/ TRACE		r L	4.8.501		92/22/82	13.
1	SURPOUTINE COMMON/TAB	TINE VEN /TAB1/G0	VENT1 (15W)	SURPOUTINE VENTICISM) COMMON/TABI/GO,SAM.COV.ENF9.OFFSET	'F 5ET	r				003210	
	NOMMOU NOMMOU	/TAB2/RK /TAB3/DC	1 . BKZ . F	COMMON/TABZ/RK],AKZ,RH]],V]],VPER COMMON/TAB3/DC,AVEN],A],A3,A4,AHOLE,VCOR	/PER AHOLE • V	COR				003230	
r	NOME OF THE PROPERTY OF THE PR	/TAB&/PS /TABS/C3	.T.PSTP .C. RMD	COMMON/TABA.PSWIT.PSTDAY.MODI.WHACK.MOD4.PHI.RH3.PH4.RMSUH.PHINT COMMON/TABS.C3.C4.RMDI3.RMD34.WHD3.RHD4.PHI.RH3.PH4.RMSUH.PHINT	AN ACK, HO	04 04.PM] 1	RH3 PH	A . RMS!	TNIHO. HI	003250	
	COMMON	COMMON/TAB6/VI,VPS.SFS. COMMON/TAB7/PJWT.TRAVEL	, VPS•5F	COMMON/TAB6/VI, VPS-5/5/KMI,PI, V3,RH3,P3,V4,VPG-5/U,APG,PH4,P4 COMMON/TAB7/PJWI,TPAVEL	V3•RH3•	D 3 • 6 • 6	74.01	e C da •	•	003210	
9	NCMMOU NCMMOU	/TABA/PS /TAB9/EL	75.PJRS	COMMON/TABB/PSRS.PJRS.PL.PR.DC34 COMMON/TABB/EL1.EG3.EG4.FKPS.FKPJ.EKG4.FSUM.EINT	CAP.EKG	4.FSUM.	FINT			003300	
	COMMON	/TAB10/R	H. WG. RS	COMMON/TARIO/RII. WG. RS.CP. CV. TEMPS. TEMPS. HLI. HLI. HLA. HI. HA.	EMP3.TEM	P4.HL1.	₩.3•₩	4.H3.	•	003310	
	RCHICO	/18511/C /18812/w	SALT ON V	COTMON/14511/CSKIP*CTABE************************************	**************************************	AK . ACS				003330	
ď	NONTROD	COMMON/TAB13/PI COMMON/TAB14/DDR.ADR.BDR	I DR.ADR.	<b>8</b> 08						003340	
	NOMMOO	/TAR15/C	L1, CL3,	COMMON/TAR15/CL1.CL3.CG3.CL4.CG4.PMG3.PML3.PMG4.RML	264. PMG3	PML3.PI	MG4.46W	<u>د</u>		003360	
	202200	/TAB16/9	HG3.2HC	COMMON/TAB16/PHG3.AML3.RHG4.RHL4.FL3.EL4.EKL4 Formon ,tab17 /vc3.vl3.vG4.vl4.FD63.F064	16,613,	EL4,EKL,				003170	
	NOMMOD	/1 A B 1 / / V	1 NC . PO!	COMMON/TABI/V053-*L3+Vc4+VL4+EP53+EP54 COMMON/TABI8/DINC+PODR (10)+PML3(10)+PMD3(10)+PML4(10)+PMD4(10)	3 (10)	MD3(10)	PML4	101.	104 ( 10 )	066600	
20	COMMON	COMMON/TAR19/SIGMA+U13+WE	I GMA+U1	3+VE						003400	
	COMMON	COMMON/TABINI/KWHITE+KOUT	KWWITE .	.KOUTD+SPE (30)	C.TITLE	(A) • TVE	MT (B).	10806	COMMON/TABINI/XXXIIIE+KOUTO+SMEC+TITLE (A)+TVENI(B)+TOROP(B)+TOIS(M) DIMENNION SVI(10)+AVI(30)	019600	
,	REA	TARLE	FVENT	OPENINGS.	_					063600	
	_	TEPPOLAT	10N TO	GET VENT OPENING	OPENING					003440	
52		ESTRED P	I STON T	RAVEL		•				003450	
	C. VENT AREA CHANGES BY "MAGIC" IN PISTON FACE.	CHANGES AFFFCT T	10 L 1 11 11 11 11 11 11 11 11 11 11 11 11	CHANGES BY MAGIC! IN PISTON PACE.	TSTON P	A C.F.				003470	
-	IF (1SH	IF (15W.Eq.2)60 TO 100	10 100			•				003440	
	C READ IN THE PEGUIPED PAHAMETERS	HE PEGUT	PEO PAH	AMETERS.						003490	
30		PEAD (5.15) NVENT	<b>-</b>							003200	
	15 FORMAT (1014) MD1TF (5.20)	FORMAT (1014) WRITE (5,20) NVFNT	<b>•</b>							0032500	
	20 FOPMAT	FORMAT ( /5X . * NVENT		(/11/1						003530	
	00 30	00 30 1=1.NVENT								003540	
35	READ (5	READ(5.25)SVT([).AVT([)	) • A V • ( I	I)						003550	
		FORMA! (17-2E 1E-4.) HYD= (A3-AVT (1)) / (A1-AVT (1))	/ (A1-A	VT (13.)						003570	
	MPITE	WPITE (6.2R) SVT(I) . AVT (I) . HYD	(I) .AVT	(T) . HYD						003540	
	ZA FORMAT	FORMAT(SX.PIS TRAV = . 1PE12	TRAV =	** 1PE12.	. 4 . 5 X . " VENT	NT AREA		=1.1PF12.4.5X	ů.	003590	
	30 CONTINUE	ONTINUE	L <b>1</b> • • • • • • • • • • • • • • • • • • •							003510	
U	FIE	MAX PIST	ON TRAV	<u>آ</u> ا.						003620	
	PSTPAV	PSTPAV2V1[/AL	2							063630	
v	AN FORMAT	FORMATION OF PARTY	X PISTO	WKIIC.CO+40175:KAV FORTATI/SK.*MAX PISTON TRAVFI	=1.1PF12.4/)	(/4.2				003450	
2				<b>)</b> ;	•					003660	
	100 CONTINUE	E.								003670	
U	Z 1 14	VENT ARE	A FROM	THE TABLE						0034PO	
5	00 120 1M=1-1	DO 120 1=2,4VENT 1M=1=1	-							003400	
<u>:</u>	505) 41	LT.SVT(	.40. (M)	[F(SPS.LT.SVT([M).0P.SPS.GE.SVT([))60	rT(I)) 60	TO 115				003710	
	dv) = da	S-5VT (IM	1)/(5VT	DD=(CPS-SVT(IM))/(SVT(I)-SVT(IM))	ŝ					003720	
	115 COUTTAILE	יונ. יונ		1112-111	- -					04740	
r.										003750	
		ST.SVT ()	IVE IT)	IF (SPS.GT.SVT (NVE.IT) ) AVENT=AVT (NVF.)T)	(NIVENT)					003760	
	0F T110N									003770	

PAGE 92/22/84 13.15.44. 76/76 OPT=1 MONND=+-+/ TPAFE SURPOUTINE VENT

<u>6</u>10

061600

and become account account account account because because because and account of

68

SUHBOUTINE VENTZ	VENTZ	16/16	ηΡΤ=1 <sup>1</sup>	APT=1 HOUND=++*/	/ TRACE	w C	FTN .	4.8.401	02/22/85	-
	SUBRO	SUBROUTINE VEN COMMON/TAB1/G	VENT2(ISW) /GO+GAM+CO	SUBROUTINE VENT2(ISW) COHMON/TAB1/GO,GAM·CNV·EHER·OFFSET	FFSET				003790	
v	000000000000000000000000000000000000000	\\TAG2\R\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	1 + PK 2 + 1 1 + AV F H T + 1 1 + C 4 + 9 M C + 1 1 + C 4 + 9 M C + 1	COMMON/TABZ/RK1.PK2.MH]1.vI].vPER COMMON/TAB3/DC.AVENT.Al.A3.A4.AHOLE.vCOR COMMON/TAB4/PSMT.PSTRAV.MOD1.MHACK.MOD4. COMMON/TAB5/C3.C4.QMOJ3.RMD34.RMD34.RMD3.RMD4. COMMON/TAB5/V1.VPS.SPS.RHI.Pl.v3.RH3.P3.	VPER AHOLE MBACK PMO3	COMMON/TABZ/PK1,PK2+4H1I,VII,VPER COMMON/TAB3/DC.AVFN1+A1+A3,A4+AHOLE-VCOR COMMON/TAB4/PSHTAV,MAD34 COMMON/TABS/C3,C4+RMD13,RMD334-PMD3,PMD4,RH1,PMT COMMON/TABS/C3,C4+RMD1318RMD334-PMD4,RH1,PM1,SPJ,APJ,RH4-PMT COMMON/TABR/VI,VPS,SPS,RH1,PI,V3,RH3,P3,V4+VPJ,SPJ,APJ,RH4-PM	9.4 В МВ . Б 9.0 СТ	COMMON/TABZ/RK1,PK%+H11.VII.VPER COMMON/TAB4/DC.AVENT-A1-A3-A4-AHOLE.VCOR COMMON/TAB4/PSHT-PSTRAV-MOD1-MHACK-HOD4 COMMON/TABS/C3-C4-RHOI3-RMD34-RMD3-RMA-PHINT COMMON/TABK/V1.VPS-SPS-RH1.PI.V3-RH3-P3-VP-J-SPJ-APJ-RH4-P4	003910 003930 003840 003850	
10	CCC 0 CC	COMMON/TA97/PJUT,TPAVEL COMMON/TAB9/FL],EG3.PJG5,P COMMON/TAB9/FL],EG3.EG4 COMMON/TAP10/FLJ,MG,RS,C COMMON/TAP11/LSKIP,LPAG	141. TRA 185. PUPS 1. 1663. E	COMMON/TABI/PJUT.TRAVEL COMMON/TABI/PSR.PJNS.PL,PR.DC34 COMMON/TABIYFL].EG3.EG4.EKPS.EKPJ.FKG4.ESUM COMMON/TABIJ/LG4.RS.CP.CV.TEWB3.TEMP4.HL1 COMMON/TABIJ/LG4KP5.LPAGE.TMS.PMAX(10) COMMON/TABIJ/LG4KP.LPAGE.TMS.PMAX(10)	C34 EKPU.F SMAX (1)	COMMON/TABJ/PJUT.TRAVEL COMMON/TABA/PSRS.PJUS.PL,PR.DC34 COMMON/TAB9/FL],EG3.EG4,EKPS.EKPJ.EKG4.ESUM.EINT COMMON/TABIJ/CUMG.RS.CP.CV.TEMP3.TEMP4.HL],HL3.HL4.HT,H4 COMMON/TABIJ/CKIP.LPAGE.TMS.PMAX(10)	EINT HL3•ML4•	4 1 1	0003340 0003340 0003340 000340	
٦٩	00000000000000000000000000000000000000	COMMON/TAP13/P1 COMMON/TAP14/DDP.ADP.BDR COMMON/TAP15/C1.CL3.CG3 COMMON/TAP16/DHG3.RH/3.RP	10P. ADR. 11. CL3 HG3, RHL	COMMON/TAP13/P1 COMMON/TA91&,NDR.ADR.BDR COMMON/TA815/CL1.CL3.CG3.CL4.CG4.PWG3.i COMMON/TA815/PHG3.RHG4.PHL4.EL3.E COMMON/TA815/PHG3.VL3.VG4.PFC3.FPS4.	CG4 + P1 HL4 + E1	COMMON/TAP13/P1 COMMON/TA916/NDR.ADR.BDR COMMON/TA815/CL1.CL3.CG3.CL4.CG4.PWG3.PML3.PMG4.PWL4 COMMON/TA916/PHG3.RML3.PHG4.PHL4.FL3.FL4.EKL4 COMMON/TA915/YMG3.VL3.VG4.PPS3.FPS4	464.PuL4		003420 003420 003480 003480 003480	
50	20 H	COMMONITABLACTING, PDOBE (10) COMMONITABLACSIGMA, ULBANE COMMONITABLACK MRITE, KOUTD CONSTANT ACCELERATION OPTION, CHOOSE THE VENTARES TO KEEP	KARITE TON OF	COMMON/TABLA/DINC.PDDR(10),PML3(10),PPCCOMMON/TABLA/DISGMA.U13.WE COMMON/TARINT/KWRITE.KOUTD.SPEC.TITLE(CONSTANT ACCELERATION OPTION. CHOOSE THE YEAR TOWN AS THE BASE PORTION ACCELERATION TO NOME AT THE BASE PORTION AS DONE AS	C3(10) EC,TT1	COMMON/TABLA/OINC.PDDR(10),PML3(10),PMN3(10),PML4(10),PMN4(10) COMMON/TABLO/SIGMA,UI3,WE COMMON/TABLO/SIGMA,UI3,WE COMMON/TABLO/SIGMA,UI3,WE CONSTANT ACCELERATION OPTION. CHOOSE THE VEHT AREA TO WEED THE BASE PRESSURE CONSTANT.	PMC4(10) UT(9) TOF	COMMONITABIANDINC.PDDR(10).PML3(10).PMN3(10).PML4(10).PMN4(10) COMMONITABIO/SIGMA.UI3.WE COMMONITABIO/SIGMA.UI3.WE COMMONITABIO/SIGMA.UI3.WE COMMONITABIO/SIGMA.UI3.WE STAWT ACCELERATION OPTION. OSE THE VENT AFEA TO KEEP THE SASE PRESSURE CONSTANT.	903940 903990 900400 00400	
55	AVETTE TO AVETE TO AVETE TO AVET TO AV	ATCHOLING AND ATTER AND OF TSTEP.  AVMIN = MIN VENT AREA AVMAX = MAX VENT AREA AVMAX = CONSTANT COMPIDEL  ACC = DENIFFED CONSTANT	EP. AREA AREA TPOLLIN	AT THE END OF TSTEP.  AVMIN = MIN VENT APEA  AVMIN = MAX VENT APEA  AX = CONSTANT CONTROLLING THE PATE OF CHANGE.  ACS = DESIDED CONSTANT ACCELERATION IN KILL-G	TE OF	AT THE FND OF TSTEP.  AVMIN = MIN VENT APEA  AVMIN = MAX VENT APEA  ACCE = DESTREP OF CHANGE OF  ACCE = DESTREP OF CONSTANT ACCELERATION IN XIIO-6	£ 1	A P E A	004040 004050 004050	
ę.		IF(ISW-EG-2)GN TO 100 READ(5-20)AVMIN-AVMAX READ(5-20)AK ACS FORMAT(1D5E12-4) HYD=KA1-AVMIN)	TO 100	Ž	•	•			004090 004090 004100 004110	
ř.	WRITE 30 FORMA MYD=( WPITE 32 FORMA	MRITE(6.30)AVMIN.HYD FORMAT(/5X.*AVMIN =: 1PE1 HYD=(A3-AVMAX)/(A1-AVMAX) HPITE(6.32)AVMAX.HYD FORMAT(/5X.*AVMAX =: 1PE1	IIN.HYD MIN = 1 / (Al-Alax.HYD	1PE12.4.	5x . t.	WRITE(6,30) AVMIN.HVO FORMAT(/5x.*AVMIN ='.1PE12.4.5x.*HYDRALIC DIFF ='.1PE12.4) HYD-A3-AVMAX)/(A1-AVMAX) WPITE(6,33) AVMAX.HYD FORMAT(/5x.*AVMAX ='.1PE12.4.5x.*HYDRALIC DIFF ='.1PF12.4)	<pre>:F = * 1PE12.4) :F = * 1PF12.4)</pre>	12.4)	004130 004140 004150 004160	
c •	WPITE(6. 40 FORMAT(7 100 CONTINUE PETURN END	WPITE(6.40)AK,ACS FORMAT(/5X,'AK =: CONTINUE RETURN	ACS =+,1PE	112.4.5Xv	• ACS 3	WPITE(6.40)AK.ACS FORMAT(/SX.AK ='.1PE12.4.SX.'ACS ='.1PE12.4/) CONTINUE RETURN			004140 004140 004200 004210	

	SII9POUTINE VENT	VENT3 75/75 NPT=1 HOILIND=+-+/ TRACE FIN 4.8+501	02/22/65 13.15.44	DAGE	10
	-	SUPROUTINE VENT3(ISW) COMMON/VAR1/GO.GAI.COV.FNFD.OFFSFT	004240		
			004290		
	•		004250		
	r	COTACON/TRABANCO.C4.RADIO.RAV.BODI.AGGA.RADA.RADA.RADA.RADA.RAS.CAA.RANCO.CA.RANGO.C	004280		
		COMMON/TAB6/V1.VPS, SPS, RH1.PI.V3, RH3.P3, V4.VPJ.SPJ.APJ.PH4.P4	066400		
		COMMON/TABT/PJUT TRAVEL	00430		
	10	COMMON/TAB9/FL1.EG3.EG4.EKPS.EKPJ.EKG4.ESUM.FINT	004320		
		COMMON/TARIO/PUJ-WG-RS.CP.CV.TEWP3.TEWP4.HLI.HL3.HL4.H3.H4	004330		
		COMMON/TABLI/LOKING PROFESTING AND	004340		
		COMPONITABILITY OF THE PROPERTY OF THE PROPERT	004360		
	15	COMMON/TABLA/DDR. 404.80P	904370		
		COMMON/TA915/CL1, CL3, CG3, CL4, CG4, RMG3, RML3, PMG4, RML4	004340		
		COMMON/1AR16/RHG3*RHL3*RHG6*RHL4*FL4*EL4*ENL4 Common/4************************************	004340		
			004400		
	20		004420		
		COMMON/TARINT/KWRITE-KOUTD-SREC-TITLE(R),TVENT(8),TDROP(8),TDIS(8)004430	3)004430		
	•	OENTERSION SVI (30)			
	, u	ASSUME INFINITELY THE	004470		
	, s <sub>2</sub>	AT IS THE APEA OF THE	004470		
		A3 IS THE AREA OF THE COMBUSTION SIDE (INCLUDING BOLT	9044B0		
		PRED IN THE APEA OF THE ROLT HOLE And the table of vent abeas.	004400		
70	و	IF (ISW-EG-2)GO TO 1	004510		
	30 00	PEA	004520		
		READ (5.15) NVENT	004530		
		15 FORMAT (1014)	004740		
		20 FORMAT (/5x**NVENT ***14/)	004560		
	35	00 30 I=1.NVENT	004570		
			004590		
			004590		
		WRITE (6.2M)SVT (1).AVT (1)	000000		
	•	INAV ETELINSTONATION ANDA	075400		
			00455		
		NOTIFICATION AND THE CONTRACT OF THE CONTRACT	00440		
		35 FOPMAT (/5x+ AREA OF CENTER HOLE =+, 1PE12.4)	004450		
		HYD=(A3-AHOLE)/(A1-AHOLE)	004560		
	<b>\$</b> }	7 (6.38)HYD	004670		
	•	38 FOPMATI/SX. "HYDROLIC DIFF	004690		
	U	COMPUTE THE AREA	004640		
		01) 70 LH(+NVEN)	004710		
	ç	1) =SORT (AROD (1)	004720		
		COMPUTE THE VOLUME OF	004730		
		6,	004740		
		0 40 140 140 140 140 140 140 140 140 140	004770		
	<b>y</b>		50 C F F F F F F F F F F F F F F F F F F		
	-				

Stimbolit	StimboliTing VEHT3	74/75	1=1	OPT=1 ROUND=+=*/ TRACE	/ TRACE	F	FTN 4.8+601	92/22/45	13.15.4
	C SCALE	SCALE THE DISTANCES SO THAT T THE INDUT LIQUID VOLUME (VI).	VCES SO	THAT THE (VI).	SCALE THE DISTANCES SO THAT THE LIGUID VOLUME MATCHES THE INDUT LIGUID VOLUME (VI).	IE MATCHE	<b>y</b>	004810	
04	200	SC=V11/VL PO 42 1=1.MVENT	EN H					004420	
	42 SV	SVT(1) = SVT(1) + SC	) • SC					00440	
	S & &	DO SK IFIFMVENT RVENT=SORT((AVT	17.1 17.1 (1) • A	P00(1))/3	NO AR I=1.WVENT RVENT=5ART((AVT([)+AMOD([))/3.141592654)			004860	
ξ.	4 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	GAP=PVENT=AROD(!)	30:13 41:13:4V	T(1).4P00	GAP=PVENT=ARON(1) BRITE(6.70)SVT(1).AVT(1).APOD(1).BPOD(1).GAP	GAP		004870	
	ш.	APOD = . 10	15 TPAV	1PE12.	FORMAT(SX. PIS TRAV = IDE12.4.5X. AVT = IDE12.4.5X.	10512.	195X.	004840	
;	S	PSTRAVESUT (NVFNT)	VFNT)				, ,	016400	
e .	75 FO	FORMATI/SX. 144X P	STURY MAX PIST	ON TRAVEL	#PITF (0.75) PSTOA TRAVEL #1.1PE12.4)			004030	
	a.	SPS=0.0						004940	
		OU CONTINUE FIND THE VENT AREA.	2F & 2					004400	
7.5		DO 120 I=2.NVENT	VENT					004970	
	â u		90	20 20 20 20 20 20 20 20 20 20 20 20 20 2	[Mat]+] Spinor of extrema OD.com of curity and to like	9		004080	
		PP=(SPS-SVT(IM))/(SVT(I)+SVT(IM)	AS)/(m]	T(1)-SVT	[4]	•		002000	
c	ENTAR O	INTERPOLATE THE DOD DAD [15]. DDEDDOD (IN) DDD (DDD) (I) -DDDD (I)	OCACIONO	1.15.	1			005010	
:	2	RIMERROD([w)		•	•			00500	
	œ ¥	18=piorrodr Ivfnt=amole-ar	8					005040	
:		THE CORRECT	TION FOR	THE RATE	FIND THE CORRECTION FOR THE RATE OF CHANGE OF VI AND V3	F VI AN	. v3	005060	
ŗ	DOONE	DONE BY REPRESENTING V	OA SHILL	LUME AS F	BY REPRESENTING VOLUME AS FUEL CHAMBER VOLUME MINUS	VOLITUE	INUS	08080	
		DI-UME AND O	10 MPUTIN	G THE RAT	ROD VOLUME AND COMPUTING THE MATE OF CHANGE OF THE RADT=VPS+(PROD): PROD([M])/(SVT(])-SVT([M))	# (S	ROD VOLUME.	002100	
,	<u>ن</u> >	00=(PI/3.0	) • SdA) • (	RD-RR-DR-	VCOR=(PI/3.0) + (VPS+(RP+R+BR+BIM+BIM+BIM)+	•		005110	
c o	י אינ	+ (SPS-SVT(IM))+PRDI+(RIM+Z+O+RF)) CONTINIE	) • PRIJT •	(RIM•2•0•	18 P. J.			02120	
		CONTINUE						005140	
	1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	RETURN						005150	
	•								

SURPOUTINE DROP?	16/16	76/76 OPT=1 ROUND=+-#/ TRACE	FT4 4.9-401	02/22/85	02/22/85 13.15.44	با 4 کا	_
8117	C PALTING	. COOPU JAILINGBIIS		005170			
100	WON/TABLE	1/00R+A0R+B0P		005140			
C DROPLE	T - CONST	TANT SIZE.		061500			
C READ I	IN THE INP	UT PAPAMETERS.		005200			
DEA	00(01:5)0	3R, 4DP, 8UR		005210			
10 FOR	MAT(1PSE1	12.4)		005250			
Ida	TF (6,20)D	304.40R.30R		005230			
20 FOP	********	100P = 1.1PE12.4.5X1.40R = 1.	,1PE12.4.5X,	005240			
	10R = 1.1PE	12.4)		005250			
96.1	Na:			005260			
				000000			

SUPROUTINE DROP3 COMMON/TAB14/DDM,ADM,ADR COMMON/TAB114/DTMC.PDDR(10),PWL3(10),PMN3(10),PWL4(10),PMD4(10)	1003 1009.408.408 1009.4008(10).5423(10).5403(	10),PML4(10),PMD4(10)	005290 005290 005300 005310	
DROPLETS - SHPINK WHILE BURNING.  PEAD IN THE THPUT PARAMETERS.  PEANES, 101008, 4008, 4008	HK WHILE BURNING. IT PARAMETERS. ADR. ROR		005370 005330 005360 005350	
UPITE(6.20)00R.40R.90P 20 FORMAT(/5%.00P =:. PE 2.4.5%,'ADP =:. PE 2.4.5%.	F.40R.80R 10p =:,[PE12.4.5%,'ADo =:,[PE [2.4]	12.4.5K.	905360 005370 005380 905390	
PDDP(1)=DQ4.0.95 CINC=ODP/10.0 WPITF(6.50)! PDOR(1) 50 36 1=2.16 PDDP(1)=DDDR(1)=DINC	2000 (1) NOOR (1)		0054400 005410 005420 005430 005440	
WDITF(6,60) I.PDOR(I) 30 CONTINUE 50 FORMAT(5X*'ODOR'.I&. **.IPE12.4) 60 FORMAT(5X*'ODOR'.I&. *'.IPE12.4) PETIEN END	PODR(I) PODR:.[4.° = *.]PE12.4)  DR:.[4.° = *.]PE12.4)		005440 005440 005440 005440 005700	

	SUGGOUTTHE PISHES	0	SHES	74/75	nPT=1	(Profiles	Sold /***#Gillion laidu	Tokij	ž L	FTW 4.84501	Sa/55/50	13.15.44	õ
-				CHARRITTMF PISPFS(ISW.SPS.PGPS) COUMDN/TARA/PSWT.PST4AV.WOD1.444CK.YO^A THERSION SFAC(10).SPIS(10).345(10) TETTELEO. 3760 TO 100	SPES(19)	SW.SPS FRAV.M.	. PSPS) 001 - 44 101 - 34	ACK+11074 S(10)			005530		
ď		ပ	PEAD IN DEAD 10 FORM VPITI	PEAL 13 THE PISTON RESISTANCE. DEAL(5-10) WPIS 10 FORMAT(1014) NPITF(6-12) WPIS = -14-5X/)	7 FEST 8 1 ST 8 1 ST 8 ST 8 ST 8 ST 8 ST 8 S	STANC	. · · · ·				005540 005540 005540 005540		
=		U	PEAD SE IE PEAD (5+2) 20 FORMAT(1) 25 CONTINUE NOPMALIZE T	no pe I=1+4PIS pean(5+20)SPRAC(I)+PRS(I) of populatipine12+4) es continue normalize to max pistom fravel.	S (1) • F 2• 4)	PRS(I)	<u>.</u> ب				005470 005470 005630 005630		
15			SPIS SPIS WRITI	00 35 1=1.NPIS SPIS(1)=(SFAC(1)/SFAC(NPIS))*0STBAV MRITE(4.30)SFAC(1),SPIS(1).PWS(1) FORMAT(5x,*FRAC PIS TRAV =**,1PE12.4*; * 5x,*PIS RESIGTANCE =**,1PE12.4*)	S C(I)/SF PAC(I) TAC PIS STANCE	SPIS( TRAV	P(S))*( [)*PWS =**(PE	DO 35 I=1.NPIS SPIS(I)=(SPPAC(I)/SPAC(NPIS))*DSTDAV WRITE(6*30)SFPAC(I)*SPIS(I)*PPS(I) FORMAT(5x,*FRAC PIS TRAV **,1PE12.4*5x,*PIS TRAV **,1PE12.4* 5x,*PIS RESISTANCE **,1PE12.4*)	PAV =	*•1PE12.4•	005640 005670 005640 005640		
Ç.		ົບ	35 CONTINUE RETHRA 100 CONTINUE FIND THE PI	35 CONTINUE RETIRA 100 CONTINUE FIND THE PISTON RESISTANCE PRESSURE. 70 110 1=2.NP15	PESIST	ANCE P	PESSUR	្			005710 005720 005730 005740		
\$\$			IMEI-1 IF (SPS-L PP=(SPS- PSRS=PRS 108 CONTINUE	<pre>IMEI-1 IF (SPS.LT.SPIS(IM).OR.SPS.GE.SPIS(I) PP=(SPS.SPIS(IM))/(SPIS(I)-SPIS(IM)) PSRS=PRS(IM)+PP*(PRS(I)-PRS(IM)) CONTINIE</pre>	ibd) • dd 5) / ( (NI 5) / ( (NI	28.585 SP15(1 5(1)-P	.6E.SP )-SPIS PS(IM)		α		005750 005770 005730 005740		
30				INUE							005910 005920 005930		

SURBOUTINE PISI	E 1151	74/74	nPT=1	npt=1 9nUND=+=●/ TRACE	1 / 1	PACE	FTN 4.4+601	02/22/45 13.15.44	17.15.66	4
		SUBROUTINE DISTITSA) COMMON/TAR3/DC.AVEVI.A1.A3.A4.AMOLF.VCOP	151 (154 20. AVEA	T.A1.A3	A + + + + + + + + + + + + + + + + + + +	OLF VCOP		005840 005850		
un.	c offs	COMMON/TABE/VI.VPS.SPS.EHI.PI.V3.8H3 DIMENSION SFBAC(30).SPIS(30).DCF(30) CHARGE CREFFICIENT AS A FUNCTION OF I	71.VPS.	SPS. PH1	P1.03	COMMON/TEBE/VI.VPS.SPS.PHI.PI.V3.8H3.P3.V4.VPJ.SPJ DIMENSION SFRAC(30).SPIS(30).5CF(30) DISCHARGE COFFICIENT AS A FINCTION OF PISTON TPAVEL. IFITAM FO.2160 TO 100	COMMON/TABG/VI.VDS.SPS.PH.PI.VJ.8H3.PJ.V4.VPJ.SPJ.APJ.PH4.P4 PIPENSION SFRAC(30).SPIS.30).DCF(30) THAGGE COFFICIENT AS A FINCTION OF PISTON TPAVEL. FFIRENCE, 20, 60, 10, 10, 10, 10, 10, 10, 10, 10, 10, 1	005840 005840 005840		
61	C REAL	READ IN THE DISCHAPGE COEFFICIENT TARLE. READ(5.10)NDC 10 FORMAT(1014) WATTF (6.12)NDC WATTF (6.12)NDC	HAPGE	GE COEFFIC	IENT T	APLE.		905920 905920 905930		
۲.	2.00 N	TO TO THE TOTAL	AC(1) •(2•4)	OCF (I)				005440		
20	<u>ຂັ</u> ທ ຕິຕ	DO 35 I=1.NOC SPIS(I)=(SFRAC(I)/SFRAC(NOC))*PSTPAV WPITE(6.30)SFRAC(I)*SPIS(I)*NOF(I) FORMAT(SX.*FRAC PIS TRAV =*.1PEI2.4. * SX.*OIS COEFF =*.1PEI2.4.)	AC(1)/5  RAC(1) AC PIS F = +1	FRAC (NDO	0)) + PS  -hcF(	7PAV [] 2.4.5x.*PIS TI	DO 34 I=1.NDC SPIS(I)=(SFRAC(I)/SFRAC(NDC))*PSTPAV WPITE(6.30)SFRAC(I)·SPIS(I)·NCF(I) FORMAT(Sx.*FRAC PIS TRAV =**. PE 2.4.5x.*PIS TRAV =**. PE 2.4. > 5x.*\DIS COEFF =**. PE 2.4.	006510 005520 006030 005530 005550		
\$2	100 C FIN	PFTURN 100 CONTINUE FIND THE DISCHARGE COEFFICIENT. 100 110 1=2.NDC	96E COE	FICIEN	ۓ			006970 006990 006090 906100		
30	108		00) *da	SPIS(I).	55.5PI -SPIS( (I4))	IF(SPS.LT.SPTS(IM),OR.SPS.GE.SPIS(I))GO TO 10A PP=:SPS-SPIS(IM))/(SPIS(I)-SPIS(IM)) DC=DCF(IM) + PP+(DCF(I)-DCF(IM)) CONTINUE CONTINUE RETURN	¢.	906120 906130 906140 906150 906160		
35		EHO						005190		

Rock of Estated Library (Court of Locotestal Report of Court of Co

<u>"</u>

v	SIJ9ROUTINE DISC	0154	74/76	OPT=1	OPT=1 MOJND=+-0/ THACE	F	D A C E	# 1 F	FTN 4.8+601	02/22/85	13.15.44	PAGE	
-		± 000	SIMPOITTNE DISSILSW) COMMON/TARBS/DG.AVE'ST.AI.AI.AA.AMOLF.VCOR COMMON/TAPA/PSWT.PSTRAV.MODI.49ACK.40DA	SP (ISW C.AVEY SWT.PS	1.A1.A3.	A4. AH	OLE.VCOR CK.4004	i		906240 006240 006210			
S.	G	COM DISCHA	COMMONTAGE/V1,VPS,SPS,RH1 Dimension Plin(30),OCF(30) Chappe Coefficient AS A FU TF(ISW-F0,2)GO TO 100	1.VPS. 0(30). CEERT	5PS.RH1. OCF (30) AS A FUN	P1. V3	COMMON/TAGE/VI,VPS,FPS,8H1,P],V3,PH3,P3,V4,VPJ,SPJ,APJ,RH4,P4 Dimension Plin(30),OCF(30) ISCHABAE COEFFICIFHI AS A FUNCTION OF LIQUID PPESSURE, IFIISW-F0,2760 TO 100	J.SPJ.	40.4HB.D4	006230			
1.9	U	« - ·	EAD IN THE DISCHAPGE COEFFICIENT TABLE. PEAD(5,10)NDC 0 FORMAT(1014) WRITE(6,12)NDC 0 FORMAT(1014)	HAPGE (	GE COEFFICE	ENT T	APLE.			006250 006270 006290			
15		25 CON 25	DO 25   = 1, NDC   - 1, 1, 1, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,	2.4) 2.4) 10(1) -0	SF (I)	*••1PE	roate().500 25 1=1.NDC PEAD(5.20)PLIG(I).DCF(I) FORMAT(IP10E12.4) WPITE(6.30)PLIG(I).DCF(I) FORMAT(5x.*LIGUID PRESSUPE =*.1PE12.4.5x.*0IS COEFF =*.1PE12.4)	COEFF	. =••1PE12•4)	006310 006310 006320 006330 006340			
20	υ	, <u> </u>	PMAX=0.0 PETUDN O CONTIND IND THE DISCHARGE COEFFICIENT. DO 110 1=2.NDC	وو دوور دو	FICIENT	.•				006370 006390 006390 006400			
22		108 CON	<pre>IM=1-1 IF (P1.LI.PLIG(IM).OM.Pl.GE.PLIG(I)) PP=(P1.PLIG(IM))/(PLIG(I)-PLIG(IM)) GC=nCF(IM) + PP*(OCF(I)-OCF(IM)) CONTINUE</pre>	(14) •01 (14) (16) (14) (16)	10(1)-P	PL19() (1%)				006630 006630 006630 006650			
30		,	PETURN END							006490			

AND EXCRETE PORTRICK EXCRANGE VANDANGE SOFESSA FRANCISCO SPERMS SOFESSA FORMS TO THE SOFESSA FOR SOFES

S3dCodd 3v11NudbNS	PPOJPES	76/74	001=1	OPT=1 40UM7=+=4/ TAACE	TAACE	FTN 4.8+61	02/22/85 13.15.64	13.15.44	PAGE
	Journ	OG BISTIN	O.IPFS ( I	(Serderes ASI) Sadroed aniilloomis	·		006500		
	DIME	DIMENSION STR(10) PTR(10)	101.01	R(10)	,		006510		
	11)41	IF(159.E9.2)60 TO 100	0 10 10				006520		
U		PROJECT	TLE PES	FIND THE PROJECTILE PESISTANCE PRESSHIPE.	ESSHRE.		006530		
	PEAD	READ (5.10) NPROJ	20				006540		
	10 FOPMA	10 FOPMAT(1014)					006550		
	WRITE	WRITE (6.12) NPROJ	POJ				006540		
	12 FORM	12 FORMAT(/5X, INPROJ =1.14/)	PROJ = P	.147			004570		
	2 00	DO 25 1*1.NPROJ	70				006540		
	PEAD	PEAD (5.20) STR (1) . PTR (1)	(I) .PTR	3			006590		
	20 FOPMA	20 FOPMAT(1P10E12.4)	2.43				006400		
	THE	WRITE (6, 22) STR(I) . PTR(I)	74. (I) A	R(I)			006610		
	22 FORM	AT (5 X . 172	AVEL = "	. 1PE12.4.5	X. IRFSISTIVE P	22 FORMAT(SX++T3AVEL =+ 1PE12-4+5X++RFSISTIVE PRESS =+ 1PE12-4)	006420		
	25 CONTINUE	INUE					006430		
	PETUPA	7					006440		
	100 CONTINUE	INIE					006450		
J	C FIND THE	FIND THE RESISTANCE PRESSURE.	NCE PRE	SSIJRE.			006540		
	00	UO 110 1=2.NPBOJ	00				006470		
	[-1=4]	-					006640		
	IF (SF	J.LT.STR	(I-1).0	R.SPJ.GE.S	[F(SPJ.LT.STR(]-1).0R.SPJ.GE.STR(])) 50 TO 108	£.	006490		
	DDE (	SPJ-518 (1)	M))/(ST	PP= (SPJ-STR (IM))/(STR(I)-STR([4))	÷ .		006700		
	PURS	=PTP(14)	d) edd +	CHI) TO- (I) A PP+ (PIR(I) - DTD (IM)	(1)		006710		
	108 CONTINUE	1111					006720		
	110 CONTINUE	3014					006730		
	15131	9J.6T.STR	(LORPROJ)	(F(SPJ.6T.STR (NPROJ)) PJRS=0.0			006740		
	RETION	Z					006750		
	G ND						006740		

SUPPOUTINE BRIMS	54180	76/76	0PT=1	OPT=1 ROUND=+-+/ TOACE	TOACE	FTN 4.8401	97/25/45	92/22/A5 13.15.44	PAGE
	SURR	OUTINE PO	THZ (NP)	SURBOUTINE BOIM2 (NPRIM. PRIMER.P?: < >	P91.4)		006770		
	0146	DIMENSION Y (50)	ê		•		- 0067BO -		
J	PRIMER	PEGINS AS	10011	PRIMER REGINS AS LIGHID DRAPLETS.			006790		
	SET CHA	MAER PRES	SIBFS	SACK TO AT	SET CHAMBER PRESSIDES BACK TO ATMOSPHERIC PRESSIDE.	SSIJPE.	006490		
	Y (8)	Y(8)=,10135					006810		
	¥(13	Y(13)=,10135					906A20		
J	: SPLIT T	HE PRIMER	UP 8E	INEEN REGIO	SPLIT THE PRIMER UP BETWEEN REGION 3 AND REGION 4.	0N 4.	006930		
	V3×Y (6)	(9)					006840		
	(6) A##A	6)					006450		
	Y (15	Y (15) = PO   MER+V3/ (V3+V4)	V3/(V3	. (4)			004940		
	Y (17	Y(17) = DP [MEROVA/(V3+V4)	·E \ 1 / 4 \	(*)			006970		
J	SUBTRAC	T OFF SOM	F 0F T	4E MASS FOR	SUGTRACT OFF SOME OF THE MASS FOR THE GAS COMPONENT.	PONENT.	006890		
	Y (15	Y(15) =Y(15) *(1,0-,10135/PGT)	1.0-1	1135/PG1)			006890		
	Y(17	Y(17)=Y(17) *(1.010135/PGI)	1.0-1	1135/2611			006900		
	IF SHRI	NKING DAD	PLET OF	PTION. SET	LIGHTO INTO	SHRINKING DROPLET OPTION. SET LIGHTO INTO DESIRED CLASS.	006910		
•	1=17	= 7+NPR W	ı				026900		
	Y (1.7	Y(17+1)=Y(15)					006930		
	1=27	=27+11PDIM					006940		
	(I) X	((1)=x(11)					006950		
	RETURN	20.					096900		
	ENO						006970		

<b>J</b> .	SUBROUTINE CAPTION	PTION	14/76	OPT=1	OPT=1 ROUND=+-4/ TRACE	18		2	FTN 4.8+501	02/22/45	13.15.44	
-		SURRO	SURROUTINE CAPTION	PTION						006980		
		WAITE	WPITE (6.500)							006900		
		ARITE TE	#RITE (1.501)							007010		
r		MPITE	WPITE (9.503)							00700		
		WPITE	WPITE (10, 504)							007030		
		WAITE	WPITE (11,505)							007040		
		F 1 6 2 2	WPITE (12,506)							00700		
-		1 2 3	WALTE (14.50A)							070700		
•		FRITE	WRITE (15.509)							007090		
		ERITE	WRITE (16.510)							00100		
		WRITE	WRITE (17.511)							001100		
	500		T(1H1.4X	SM) TI.	1 5 X P.	×6.	FORMAT(1H1,4X.1T (MS)*,5X,*P1*,9X.*P3*,9X**PL*,9X,*P4*	.9×.	. 54.	007110		
15		•	PP . 9X .	5 050.7	X . 1 PS	7 X	OX. DBI. 9X. 15 PSI. 7X. 1 PSI. 7X. 15 PUI. 7X. 1 PUI. 7X. 14CC K-G1/1	5	K+14CC K-G1/)	007120		
		501 FORMA	T(1H1.4X	PT (MS	1 5 X RH	1.89	FORMAT(1H1, 4 X + 1 (MS) + , 5 X + 1RH1 + , 8 X + 1RHL 3 + , 7 X + 1RHG 3 + , 7 X +	2HG3	7x.	007130		
		EHd: +	1 AX RH	L47X.	1 PH3 1 , 9X , 1 RHL 4 1 , 7X + 1 PHG4 1 , 7X 1 4 RH4 1 / )	, RH.	·.			007140		
	ř	02 FORMA	T(1H1.4X	SM) L.	1 * * 5 X * * V 1	* 4 9 X	402 FORMAT(1H1.4x.+T (MS)+.5X++V1++9X++VL3++8X++VG3+AX++V3++	3		007150		
		. 9x.	VL48x.	94.457	X VA 9 X	• EP	9x, +VL4+,8x++VG4+,8x++V4+,9x+*EPS3+,7x+*EPS4++7x+*AVE4T+/)	.7X.	AVENT ./)	007160		
Ş		03 FOPMA	T(1H1.4X	SM) L.	1 5X PH	1:49)	403 FORMAT (12104X001 (MS)00SX00PH1008X00RH13007X00RG3007X00PH300	RMG31	. 7X. PM3.	007170		
		· BX ·	RML4. 7X	. PRMG4.	RX. FRML 4 . 7X. FRMG4 . 7X. FRM4 . 9X. FRMSIM . /)	. 9X	· RMSIM · / )			007140		
	ř	04 FOPMA	TCIHI.4X	SM) L.	1 * , 5 X * * R M	0134	404 FOPMAT(1H1.4X.+1 (MS)++5X++RMD13++6X++RMD3++7X++RMD34++6X+	• • RM	)341,6X1	007190		
			40.7X.04	-1 AX.	* HL3 * * 8 X *	. H3.	+ PRMS 41,7X4 THE 14,8X+ PHE 31,8X+ PH31,9X+ PHE 41, PK+ 141/1	,	=	007200		
	Ĭ	05 FOPMA	T(1H1.4X	T (MS	) * * 5 X * * CL	1., 8)	505 FORMAT (1H1,4x, T (MS) ",5x, CL1", AX. "CL3", BX. 1CG3", 9X+"C3",	631,	4X • • C3 • •	007210		
7		• • ×6 •	CL4. AX.	6664.48	X6	• TE	9x, .CL41, AX, .CG41, 8X, .C41, 9X, .TE4P31, 6X, 'TEMP41/)	?;		007220		
,		SOG FORMA	T(1H1.4X	SH) LI	1 5x FL	1	FORMAT(1H1,4x,17 (MS) ",5X,1FL1",8X,"EL3",8X,"EG3",8X,"EL4",	63.,	AXEL4".	007230		
	•	•	EG48x.	· EKPS ·	7X. FKPJ	.7X.	AX EG4 AX EKPS 7X EKPJ 7X EKL4 7X EKG4 7X F.SUP /	64.	7X.1FSUP.17)	007240		
	Ĭ	SOT FORMA	FORMAT (1H1 . 4X T	SM) L.	(MS) . , 5X PARTITIONED	RTIT	TONED RML3.71			007250		
	· ir	SOR FORMA	FORMAT (141.4X T	** T (MS	(MS) SX PART [ T TONE D	RTIT	TONE 0 PH03+/)			007240		
30			FORMAT (1H1 .4X T		(MS) 5X PARTITIONED	RTIT	TONED RML4./)			407270		
i			FORMAT (1H1 . 4X T		1 5x PA	RTIT	(MS) + 5X + + PARTITIONED RMD4+/)			007290		
			FORMAT (1H1.4X T		1 5 x Ul.	3.83	(MS) *,5X,*U13*,8X,*WE*,9X,*DC*/)	?		062100		
		RETIPN	Z							007 300		
		CN								007310		

13.15.44										
92/22/45	007320	007350 007360 007370 007340	007400 007410 007420 007440	007450	007500 007510 007520 H) 007530	007550 007550 007570 007580	007500 007510 007520 007530	007650 007650 007670 007690 007760	007720 007740 007750 007750 007770 007770	00/1900 00/1910 00/1920 00/1940 00/1950 00/1970
SUARDIITIME DIIT 74/75 OPT=1 40UND=/ TBACE FTN 4.8.401	SURROUTINE DUIT COMMON/EPCOMO/MUSED.NOVSED.MSTEP.NFE.NJE.MMI COMMON/TARI/GO.GAM.COV.ENER.OFFSET	COMMON/TARZ/DKI.PKZ.JHII.VDER COMMON/TARJ/DC.AVENI.AI.A3.A4.AHOLE.VCOP COMHON/TAB4/PSTRAV.MODI.MRACK.NODA COMHON/TARZ/C3.C4.HMDI3.RAD34.JMD3.RAD4.RAD4.RAD4.RAD4.RAD4.RAD4.RAD4.RAD4	COMMON/TAGT/PJWT.TRAVEL COMMON/TAGR/PSPS.PJG.PP.DC34 COMMON/TAGR/PSPS.PL.PP.DC34 COMMON/TAGRJOFG.PG3.EG4.FKPS.EKPJ.EKG4.FSUW.EINT COMMON/TAGRJOFG.WG.PS.PCP.CV.TEMP3.TEWP4.HL].HL3.HL4.H3.H4 COMMON/TAGRIJ/LSKIP.LPAGE.THS.PMAX(10)	COMMON/TABIZ/AVENT.NVENT.AVMIN.AVMAK.AK.ACS COMMON/TABIL/ODR.ADR.ADR.ADR COMMON/TABIL/COR.ADR.ADR.ADR. COMMON/TABIS/CLI.CL3.CG3.CL4.CG4.DMG3.RML3.RMC4.RML4 COMMON/TABIS/CLI.CL3.RMG4.RML4.EL3.EL4.EKL4	COMMONTARIO/VG3.VL3.VG4.VL4.EPS3.FPS4  COMMONTARIO/CDINC.PD0R(10).PML3(10).PML4(10).PML4(10).PMD4(10)  COMMONTARIO/CIGAA.UI3.WE  COMMONTARIO/CIGAA.UI3.WE  COMMONTARIO/CIGAA.UI3.WE  COMMONTARIO/CIGAA.UI0.SPEC.TITLE(R).TOROP(R).TOROP(R).OOTS30  C WRITE OUT THE DATA AT THE END OF EACH TIME STEP.	WRITE(6.510)TMS.P],P3.PL.P4.PR.SPS.VPS.SPJ.VPJ.APJ WRITE(17.512)TMS.RMI.RHL3.RMG3.RMIL4.RMG4.RM4 WRITE(8.510)TMS.VJ.VL3.VG3.VA.VG4.VE4.EPS3.REPS4.WFVT WRITE(9.510)7MS.RMI.3.RMG3.RMM3.RML4.FMG4.RMG!W WRITE(10.510)7MS.RMD3.RMD34.PMD3.HL4.HL3.H3.H3.H3.H4.HL	WPITE(11,510)TMS.CLl.CL3.C3.C3.C2.CL4.C74.C4.TEMP3.TFWP4 WRITE(12.510)TMS.ELl.EL3.E63.EL4.EG4.ERPS.ERPJ.EKL4.EKG4.ESU4 WFITF(13.510)TMS.(PML3(1).IR1.10) WFITF(14.510)TMS.(PML3(1).IR1.10) WFITE(14.510)TMS.(PML3(1).IR1.10) WFITE(15.510)TMS.(PML4(1).IR1.10)	WPITE(16.510) TWS.(PMD4(I).1=1.10)  WRITE(17.510) TWS.UI3.WE.OC  CALL OUTGEN:  510 FORMAT(11F11.3)  512 FORMAT(11F11.4)  PMAX(1) = AMMAX(P).PMAX(1))  PMAX(1) = AMMAX(P).PMAX(2))	RMAX(3)=AMAX(PR-RMAX(3)) RMAX(4)=AMAX(PR-RMAX(4)) RMAX(5)=AMAX(APJ-PMAX(5)) RMAX(5)=AMAX(APSIM-RMINT,PMAX(6)) RMAX(7)=AMAX(APSIM-EINT)/FINT,PMAX(7)) LSAFELFA(P+1) LPAGFELPAGE+1 IF (LPAGE+0-45)Gn TO 550	IF([SKIP.LT.5)RETURN LSF[P=0 WPITF(6.524) WPITF(7.525) WRITF(9.525) WPITF(1.525) WPITF(1.525) WPITF(1.525)
Ñ	-	r.	e c	ř.	0.0	\$	30	SE 9	\$	ρ. γ. δ.

SURPOUTINE OUT	76/76	0PT=1	OPT=1 MOUND=+=4/ TRACE	TRACE	FTM 4.8.501	02/27/85 13.15.44	13.15.44	PAGE
	WPITE (13.525)			•		, 067890		
	WPITE (14.525)					00790		
	WRITE(15+525)					007010		
	WRITE (16.525)					0000		
	WPITE (17,525)					00/00		
525	FORMAT(10X)					001040		
	RETURN					007950		
פיניני	CALL CAPTION					096200		
:	PAGF = 0					007970		
	1 SK 10=0					00700		
	PF TIPM					060100		
	END					00800		

SUMPOUTING DUTOES	<b>4</b> 2011)U	( ) \ L	1=140		No Control of the Con				C#/22//0	-
-	ī	SUPPOSITINE OUTGRA	OUTGPA			•			0.0800	
•	ະວ	OMMON/EPC	M9/HUSET	UCN.	SED.NST	COMMON/EPCOM9/HUSED.NOUSED.NSTEP.NFE.NJE.NMI			020800	
	ŭ	COMMON/TA91/60, GAM. COV. ENER. OFF SET	/60 . GAM	CnV	ENER OF	FSET			060800	
	บ	COMMON/TARZ/PK1.PK2.RH1I.V11.VPER	/PK1.PK	. RH	I.V.11.V.I	450			00000	
v	ΰ	OPMON/TAR	I/OC. AVE	IT . A 1	. A3. A4.	COMMON/TAR3/OC. AVENTOAL ABOA & AHOLE , VCOR			050800	
	ŭ	OMMON/TAR4	/PSWT.P	TRAV	.MOD1.MI	BACK . MOD4			00800	
	Ū	OHWON/TAES	1.63.04.5	M013	+ RMD34 +	RMD.3.PMD4.RMI.	COM40N/TAES/C3.C4.RMD 13.RMD34.RMD3.DMD4.RM1.DM3.RM4.DMS!M.DM1NT	TNIMO	008010	
	ŭ	OPMON/TARE	VV1.VPS	SPS	RH1.P1.	V3.PH3.P3.V4.V	COMMON/TAR6/V1 «VPS·SPS·RH1»P1 «V3»RH3»P4»VP3«VP3«SP3»VP4»P4	*D*	060600	
	ŭ	COMMON/TART/PJWT, THAVEL	//PUNT.TE	AVEL					006600	
10	ū	COMMON/TARR/PSPS.PJRS,PL,PR.DC34	1/PSPS.P.	RS, P	L.PR.DC	34			008100	
	Ū	OMMON/TAB	VEL 1 • E 6	1.EG4	• EKPS• E	COMMON/TARG/EL1.EG3.EG4.EKPS.EKPJ.FKG4.ESUM.EINT	FIRT		008110	
	Ū	OMMON/TAR	O/PH+WG	PS.C.	P.CV.TE	COMMON/TAR10/Pij.WG.RS.CP.CV.TEMP3.TEMP4.HL1.HL3.HL4.H3.H4	413.414.43.44		004120	
	ũ	OMMON/TA9]	1/LSKIP	LPAG	E.TMS.R	COMMON/TAG11/LSKIP, LPAGE, TMS, RMAX (10)			008130	
	ũ	OPMON/TAM]	2/MVENT	NVEN	T.AVMIN	. AVMAX. AK . ACS			008140	
15	ن ن	COMMON/TABI3/PI	3/61						008150	
	ũ	COMMON/TABI 4/DDR. ADR. BDR	47 PDR . 4	<u> </u>	α.	,			008140	
	Ū	DMMON/TAP]	יצינו זינו	3.06	3,014,0	COMMON/TAP15/CL1,CL3,CG3,CL4,CG4,DMG3,RML3,RMG4,RML	464.RML4		0.09170	
	ũ	OMMON/TAB	6/PHG3.	Ę,	RHG. PH	COMMON/TAB16/RHG3.RHL3.RHG4.PHL4.EL3.EL4.EKL4	4		008180	
	ũ	DMMON/TAR	7/463.4	3 > V (5	4.VL4.E	P53,FPS4			008190	
2،	ũ	OMMON/149]	SYDINC.	900	10)	3(10) *PMD3(10)	COMMON/TASIS/DINC. DUDP(10).PML3(10).PMD3(10).PML4(10).PMD4(10)	(10)	008200	
	Ū	DMMON/TAB]	9/516MA	113	w R		COMMON/TABIO/SIGMA+J13+WE 008210		008510	
	Ũ	OWWON/TAP]	MINEMAL	7. K.O.	UTD SPE	C+ TI TLE (A) . TVF	VT(9) . TORUP(8)	• TD IS (F	1008220	
	٥	DIMENSION COLTIT(5) . PV(5) .TIM(5) . DAY(5)	:0LT1T(5)	٠ <u>۸</u>	5) .T IMC	5) •DAY (5)			009230	
	Õ	DATA KOUNT/1/	7.						008240	
	C CREA	TE UNFORM	ITTED GRI	PH	RAJECTO	CREATE UNFORMATTED GRAPH TRAJECTORY FILE ON TAPELT	E17.		008280	
	Ä	IF (KOUNT. GT. 1) GO TO 100	.1160 TC	100					008250	
_	C FILE	FILE HEADINGS.							012800	
	•	PV(1)=OHPLGD GIIN	NIE C						008240	
	á	DV (2) = 4HCODE	<u> </u>						006500	
9	. ā	PV ( 1) = 7HVFPS TON	STOR						008300	
2	ā	PV (4) = 9H07/24/84	24/84						008310	
	. ά	H(=(5) Ad							008320	
	ũ	CALL DATE (DAY (1))	AY (1))						008330	
	ū	ALL CLOCK	TIMCIO						008340	
ž	ž	KOL S=107							008350	
,	บั	COLS=FLOAT(KOLS)	KOLSJ						008340	
	5	0.0##U0	ļ						008370	
	3	PITE (2) TIT	LE. (PV (5	=	1.121.0	WPITE(2)TITLE, (PV(5).J=1.12).DAY.TIM.DUM.DUM.COLS.DV.DUM.	COLS.PV.AUM.		008380	
	•	· DUM.DUM.DUM.DUM	M.DUM						008340	
<b>C7</b>	ة	00 40 I=1.KOLS	06.5						008400	
	ฉ	COLMIN=-1.E4	*						008410	
	ັ	COLMAX=1.E4							008420	
	ŏ	DO 30 J=1.5							008430	
		0LT[T(J)=9	HXXXX						008440	
45	30 00	CONTINUE							008420	
	>	WPITE(2)COLMIN.COLMAX,COLTIT	MIN. COL	AX C	OLTIT				008460	
	Ŭ 0 <b>4</b>	CONTINIE				•			008470	
		KOIINT=2							0084800	
	100	CONTINE							008490	
<b>6.</b> 0	>	VPSM=VPS/100.	٥.						0 0 8 5 0 0	
	>	VPJM=VPJ/100.	•						008510	
	<b>.</b>	SPUM=SPU/100.	•						00000	
	<b>ฮ</b> (	CL 1 **= CL 1 / 100.	•						000000000000000000000000000000000000000	
	<b>.</b>	CL3M=CL3/100.	•							
r	3 6	CC 4 W = CC 4 / 10 0 +	•						0.0000	
	ن ز د	C437=C437100.	• •						000000	
	5	コイトチェン ヨモまり	•						24	

SURROUTINE OUTGRA	OUTGPA	76/76		APT=1 40UND=+-4/ THACE	Z TPAC		FTN 4.8+401	4H/22/20	02/22/AA 13.13.44	4	
								,			
	A PE	C3M=C3/100						0,45,400			
	1 1 4	- COLVACEMENT						008200			
	- N. F. I.	11 3M-111 3 / 100 -						008400			
-	103	TWO.	19.59.14	P4.P9.SP	A. VPSM	WITTE COLTER TO 1 . D. C. D. C.	• 7 •	008610			
	10	SHOPE INC.	13. RH 3. K	HI . BHG.	AH4.V	PH1 JH1 3-PH63-PH3-PH14-PH64-PH4-V1-VL3-V63-V3-VL4-V64-V4-	VL4.V64.V4.	008620			
	100	FDC1 - FDC4 -		,	•			008430			
	AVE.	STATE DMI BRM	41 3.0 MG3	P. PM3. PML4	, D M G .	RM4. RMS(JM, BM	L'1315,77 13,000 3,000 3,000 6,006,006,006,000 000 13,000 3,	009640			
,	CMO		A Machae	H4. C. 1M.	Z 2	DND4. HILLIAM 3. M3. HI 4. H4. C. IM. C. 3M. C. 3M. C. 3M. C. 4M. C. 4M. C. 64M.	*CG4M.C4M.	008650			
ī	145	TEWOS. TEMBA.						008560			
	F1 -	F 1 3 - F G 3 -	16140564	. EKPS .FKP.	J.EKLA	FILLSERSON ASERAGENDO EXPLADENCE SING		008870			
	70	3671.1	10101	(PM: 2(1) - 1=1-10) - (PM)3(1) - [=1-10) -	1010			008880			
	MO		d) • (0) • [	(DI + (I) + (D+(D+(D+(D+(D+(D+(D+(D+(D+(D+(D+(D+(D+(	1.101.			009800			
		111 34 45 00		•				004700			
>	DETION							008710			
		-						0.087.0			

Supportive affrin		74/75	76/75 OPT=1 HOUND=+-#/ TAACE	101 /4-01	ıce	FTN 4.8.401	02/22/95 13.15.44	13.15.44	PA G
	SURRC	OUTINE OI	FFUN (N+TIME+Y	(* YDOT.)			008730		
•	HNOD	ON/TARINT	/KWPITE . KOHTO	SPEC. TI	[TLE(A) . TVEN]	T(A) . TOROP (8) . TDI	5(8)009740		
	15(7)	MOD (1) . E	0.10HDROP1	JCALL	FDROP1 (N.TI)	4E.Y.YOUT)	07400		
	IF (T	PROP (1) .E	9.10H0H0P2	) CALL	FDROP2 (N.TI!	4E • Y • YOUT)	008750		
s	16(7	3. (1) 40ac	9.10H0P0P3	) CALL	FDROP3(N.TI	4E • Y • Y OO T 1	008770		
	PETU	Z					008740		
	<u>د</u> بن					0081400	008100		

SUMBOUTINE FORDPI	16/15	OPT=1 ROUND=+-+/ TRACE	-+/ TRACE	FTM 4.4.40]	98/62/20	13
-	SUBBOUTINE FORD	FDROP1 (N.TIME.Y.YDOT)	, , , , , , , , , , , , , , , , , , ,		008.800	
•	DIPENSION Y(N).	Y (N) . YNOT (N)			016800	
	COMMON/EPCOM9/H	HUSED +NOUSED +	COMMON/EPCOM9/HUSED.NOUSED.NSTEP.NFE.NJF.NMI		008820	
	COMMON/TAB1/60.64M.COV.FNER.OFFSET	GAM.COV.FNER	*OFFSET		06831	
'n	COMMON/TA92/9K1.PK2.RH1I.V1I.V¤ER	+ PK2 + RH1 I + V1	I.VPER		008340	
	COMMON/TAB3/PC, AVENT.A1.A3, A4.AHOLE.VCOR	AVENT . A1 . A3.	A4. AHOLE . VCOR		008800	
	COPMON/TABA/PSUT, PSTJAV, MOD I, MGACK, MOD4	IT, PSTARV, MOD	1.49 ACK, 4004	,	008450	
	COMMON/TA95/C3.	C4 + PMD13 + PMD	34. RMD3. RMD4. RM1.	COMMON/TA95/C3,C4.P4013.P4034.R4034.R404.PA1.PA3.P44.R44.PA1VP.PAINT	008870	
	COMMON/TAR6/V1.	VPS, SPS, RHI,	COMMON/TAR6/V1, VPS, SPS, RH1, P1, V3, PH3, P3, V4, VPJ, SPJ, APJ, PH4, P4	J. SPJ. APJ. PH4. P4	0 08 89 0	
2	COMMON/TANT/PUMT.THAVEL	TOTAVEL	!		008800	
	COMMON/TARB /PSPS - DUPS - PL - PR - DC34	S.PJPS.PL.PR	•0C34		008900	
	COMMON/TABO/ELI	*EG3 *EG4 *EKP	COMMON/TABO/ELI+EGB+EG6+ERPS+ERPU+FR54+ESUM+*INT	- ZI.	016600	
	COMMON/ TAPIO/	JOHUS PECPOCK	COX***CA/ TAP! 0/ 0!0*G* KS*CP*CV*TE*P3*TEMP**HLI*HL3*HL**H3*H*	1_3.H_6.H3.F&	026900	
	CORMON/TABLI/LOKIP. LPAGE. THS. 04AX (10)	KIP. LPAGE, TM	S. 64AX (10)		008030	
١.	COMMONTARILEMAN	/ENT. NVENT. AV	COMMON/TAMIZ/MVENTONVENTO AVMINO AVMAKO AFOUS		00000	
	Lave Law Lychaet	200			056800	
	COMMONIATE AND AUF - EUR	P. AUF . EUF			250000	
	COMMON/14815/CU	1.101.30163.CT.	COMMON/14815/C[1.6C[3.C63.C[4.C4.Km63,F]6.K]5.K]4 Common/14814/20063.DH[3.6066.DM]4.E[3.E]3.E	4 Jesus 4 Car		
ç		TO VE BOUGHOUS	4.FP43.FP44		00800	
S	TOTAL MATERIAL STREET	PODB (10)	PML3 (10) - PMD3 (10)	COLUMNIA TEST NOTE OF THE PRODUCTION OF THE PRODUCTION OF THE PROPERTY OF THE	00000	
	PARENCIA PRO 10 / 10 / 10 / 10 / 10 / 10 / 10 / 10	GMA.U.J. WE			010600	
	COMMONITARILITY	CWRITE - KOUTD -	SAEC.TITLE (A) .TVE	COMMONITABILITY MAD IE - KOULD - SPEC - TITLE (A) - TVENT (A) - TDPOP (B) - TDIS (A) 009020	81009020	
•	•		******		060600	
, Y		THE MODEL.			00000	
	•	*********	*************		050600	
	VOLIME OF LIGHTD	CHAMPER.			090000	
	V1=Y(1)				0.090.0	
U	PISTON VELNCITY.				060600	
30	VPS=Y(2)				060600	
		S=0.0			004100	
J	SId				011600	
					02150	
U	LIO				009130	
35	PH1=Y(4)				000140	
U	-12				009150	
	Pl=Y(5)				009140	
		u•0=			00110	
U	2	ON CHAMBER.			0 8 1 6 0 0	
64					000100	
U	0	TION CHAMBER.			002600	
•						
U	4	STEEN CHAMBER	•		000000	
,	COLUMN OF THEFT				00000	
	• 100 - (0 ) A # 4 N				052600	
U	PROJECTILE VELOCITY	· .			009260	
	VPJ=Y (10)				009270	
O	PROJECTILE TRAVEL				009240	
c.c	SPJ#Y (11)				002600	
U	DENSITY IN TURE				006300	
	AT TAKE TO POPOS THE THE THREE AT THE THREE	" THE THRE.			015 600	
•	DA=<13)				06600	
, or	FIND THE DISCHARGE	DISCHANGE COEFFICIENT	•		000340	
		:			009350	
	TECTRIS(1).E0.10MUIS2		1C3FF DESE(2)		05660	

U		
	FIND THE PISTON RESISTANCE PRESSURE.	009370
	CALL PISPES(2.SPS.PSPS)	0 ME 600
	FIND THE DECIENTS RESISTANCE DUFACION	0000
	TOTAL DESCRIPTION OF THE PROPERTY OF THE PROPE	0000
	•	014600
	ורשרו היי	024600
	יכארר	009430
6.0	BAT IS THE MASS IT REGION 1.	009460
	[74]101	004600
	BAN IN THE MACA IN DESIGN 3.	044000
,		
	A NOTICE AND THE DESCRIPTION AND	0 0 0 0
	# > 1	200
U	THE TOTAL TENS	005600
•	erient selection of the	015600
U	PRESSURE AT BASE OF PROJECTILE.	009550
	PR=(p4+PJRS+GM4/(3.0+PJRT))/(1.0+GM4/(3.0+PJRT))	009530
75	IF (PG.LT.PJRS) DR=P4	009240
U	PASSSURE AT LEFT OF TUBE.	009550
l	PLEDBO (1.0+BEA/(0.0+D-HI)) - PLEAREDBA/(0.0+D-HI)	009540
	TE (DO I T. D. IDC. O. I. D. I. D. IDC. O. I. D. I.	000570
•	MO 10 10 10 10 10 10 10 10 10 10 10 10 10	
ٔ د	INTERPOLATION OF THE PROPERTY	0000
c	ENER3=P3+(1.0-C0V+9H3)/(PH3+(GAM-1.0))	004200
U	AVEPAGE INTERNAL ENERGY PER RAM FOR GAS IN REGION 4.	009600
	FEEDAHD4+(1-0+COV+BH4)/(BH4+(GAH+),0))	009610
	THE PROPERTY OF THE PROPERTY O	004000
		0.0000
	<b>*</b> 0=1d	069400
45	<b>₽₽₽₽</b>	000440
30	CONTINUE	009820
U	C3 IS THE SPEED OF SOUND IN THE COMPUSTION CHAMBER GAS.	009620
		000470
•		00000
	CA TOTAL CALLED THE CALL THE CORP CALL THE CALL	
5		256500
U	CLI IS THE SPEED OF SOUND IN THE LIGHID CHAMBER.	0065100
	CL1=S0RT(60*(RK1+FK2*D1)/RH1)	009710
U	RWD13 TO THE MASS FLUX FROM REGION 1 TO REGION 3.	009720
•		0.000
ć.	OF FOR CAPACITUDE OF THE PROPERTY OF THE CONTRACT OF THE CONTR	00160011111
	IF (DLW.LT.D.O.AND.MMACK.E.O.O) 4MD13=0.0	05/406
	IF (DLD.GE.0.0) RMD] 3=OC+AVEVT+SQRT (2.0+QH]+G0+DLP)	004160
	IF (MOD) .FO.010MD]3=0.0	009770
U	LIGHTO INJECTION VELOCITY INTO REGION 3.	009780
	THE PROPERTY OF THE PROPERTY O	00700
6.41	TOTAL CONTRACT TO THE CONTRACT	
v	MADS+ IS THE MASS PLUX PROM HEGION 3 TO MEGION 4.	001600
	Ta-Ed=a10	01000
	IF (DLP.LT.0.0) RMD34=-DC34+45QRT(-2.0+RH4+60+0LP)	009450
	IF (DLP.GF.O.O) RMD34=DC34=A4+SGRT (2.0+RH3+G0+DLP)	009430
901	TE CHOOLE IN COLUMN TO COL	044000
J	ELI IS THE LOUGH ENGINE IS	00000
		000460
U	EG3 IS THE TOTAL INTERNAL GAS ENEAGY IN REGION 3.	009970
	何をなるのはアにもからし	00000
	FGA IS THE TOTAL INTERNAL GAS EMERGY IN REGION A.	00800
		00000
•	The second secon	
J	ERPS IS THE RIVETIC EVENING OF THE PISTURE	015500
	EXPAND STADSMINADONE STADSMINA	
		ランファンコ

SUADULTNE FDAOP1	FDB0P1 76/75	NPT=1 ROUND=+-0/ TRACF		FT% 4.84601	02/22/85	13,15,44
115	FKPJ=n.SepJ#1evPJ-vPJ/G0 C EKG4 IS THE KINETIC ENERGY C ASSUME THAT THE DEWSITY IS C ASSUME THAT THE VELOCITY IS	EKGA IS THE KINETIC ENERGY OF THE GAS IN AEGION 4. ASSUME THAT THE DEWSITY IS CONSTANT. ASSUME THAT THE VELOCITY IS A LINEAR FUNCTION. ASSUME THAT THE VELOCITY IS A LINEAR FUNCTION.	S IN REGION 4. FUNCTION.	> 20 0 m	009940 009940 009940 009970	
120		190 TO 32			000000 010010 010020	
125	E E SUN TO THE SUM E E L1 - E G 3	EKGA-0-19.COM EKGA-0.5-RM4-11R-019/(3.0-60) 32 CONTINUE ESU4 IS THE SUM OF THE ENERGIES. ESU4=EL1-EG3-EG4-EKPS-EKPJ-EKG4 TEMP3 IS THE GAS TEMPERATURE IN REGION 3.	₩0		0100040 0100040 0100040 0100040	
) 130 135		3)/(PH3+(G S) TEMPERAT L)/(PH4+(G THE LIQUID 4E GAS IN	1.01)*CV)  1 N REGION 4.  1 REGION 1.  10N 3.			
14.1	T T T T T T T T T T T T T T T T T T T	7 TO 40		<b>:</b>	010170 010170 010170 010270 010270	
145		1000 100 100 100 100 100 100 100 100 10	) YDOT (1) = YDOT (1) + VCOR AVENT)   FORC=P3 = (A3 - AHOLE) - P   FORR=PSRS = (A1 - AHOLE)   PSRT) = (FORC - FORR)	)YDOT(1)=YDOT(1)+VCOR AVENT)  FORC=P3+(A3-AHOLE)-P1+(A1-AHOLE)  FORR=PSRS+(A1-AHOLE)  FORR=PSRS+(A1-AHOLE)	0100240	
15.5	YOUT (3) # CE   YOUT (3) # CE   YOUT (4) # CE   YOUT (4) # CE   YOUT (5) # CE   YOUT (5) # CE   YOUT (6) # VES # A 3	AND.YDOT(2).LT AND.YDOT(3).LT DOT(1).V1 - RM 1*YDOT(4).G0	7.)*C		010320 010330 010340 010350 010360	
150	IF (TVENT(1) *E0.1DHVENT3 YDOT(7) =-RH3*YDOT(6)/V3. YDOT(9) =-SG3*G3*YDOT(7)/G0 IF (RMD]3.GE *0.0) YDOT(8) =: * (V3-COV*RH3) IF (RMD]4*LE *0.0) YDOT(8) =:	* P.	)YDOT(4)=YNOT(6)-VCOR D13/V3 -RMD34/V3 (8)+¤MD13*(HL1-H3)*(6 (4)-¤MD34*(H*-H3)*(6A	.(64M-1.n)/ GAM-1.n)/	010380 010390 010400 010420	
145	• (V3-COV*PM3)  **YN:T(9)=VPQ-84  If (PR.GE.PUS)  If (PR.GE.VPS)  If (PR.GE.VPS)  If (PR.GE.VPS)  If (PR.GE.VPS)  If (PR.GE.VPS)  **YN:T(12)=VPQ  **YN:T(12)=VPQ	(V)-COV*PM3)  YDOT(9)=VPJ44  IF (PQ-GE,PJPS) YDOT(10)=(PP-PJRS) *A4*60/PJWT  FF (PQ-LT-PJRS) YDOT(10)=0,0  AP-YTOT(10)/(*09*145*1.0F?)  YDOT(11)=VPJ  YDOT(12)==PH4*YDT(9)/V4 * P*D)3*/V4	A4+60/0 JWT		010440 010440 010440 010440 010440	

ANN COUNTY OF THE PRESENCE WAS SERVER ASSEMBLY BOTTON STREET SERVER BOTTON

7

PAGF

Jaelis	SUBBOURTINE FORODI 76/76 OPT=1 40UND=+-+/ TAACE FTN 4.A.A.G.	n2/22/A5	13.15
	YDOT(13)=C4+C4+YDOT(12)/G0 IF(PMD34,60,0)YDOT(13)=YDOT(13)+PMD34+(H3-H4)+(GAM-1,0)/	010510	
175		010540	
		010560	
,	V 1 E	010540	
0 4	YDOT(1)==VPS=A  IF(TVENT(1)=En=10HVENT3 )YDOT(1)=YDOT(1)+VCOR	010590	
	-1 v) •	010410	
	NT3	010630	
185	IF (TVENT(1) -EG.10HVENT3 ) FORR=PSRS=(A) -AHOLE)	010640	
	If (FORC.LT.FORM) FOUT (2) = (GO/PS#1) = (FORC.FORM)  [F (FORC.LT.FORM) FOOT (2) = 0.0	01050	
	IF (FORC.LT.0.0) YDUT(2) = (GO/PS4T) *FORC	010670	
100	YDOT(3)=YPS 1F(SP<_LT.0.0.AND.YDOT(2).LT.0.0)YDOT(2)=0.0	910590	
•	IF (SPS.LT.0.0.AND.YOOT (3) .LT.0.0) YOOT (3) =0.0	010700	
	Y001(4)==PH1@Y001(1)/V1 - PH013/V1	010710	
	YDOT(5)=CLI=CLI=TOG: 4)/60 YDOT(A)=WPC+A3	010730	
105	IF(TVENT(1).EQ.10HVENT3 )YUOT(4)=Y00T(6)-VCOR	010740	
	YDOT (9) =VPJ+44	010750	
	V34=V3+V4 DE34=DE3+DE4	010760	
	Y001(7)#+QH30(Y001(6)+Y001(9))/V34 + RW0]3/V34	010140	
200	Y00 T (A) =C3 = C3 = Y00 T (7) /G0	010100	
	IF (BHD13.6E.0.0) YOOT (8) #YOOT (9) +PMD13+(ML1-H3)+(GAM-1.0)/	010800	
		028010	
	IF (PR.L.T.PURS) Y001(10)=0.0	010830	
205	APJ#YD01(10)/(.0981%0-1.0E7)	01040	
	J007(11)#(11)	010850	
	▼UOT(12)=₹00T(7) ▼D0T(13)=∀00T(0)	01010	
	TO THE PROPERTY OF THE PROPERT	010880	
210	UE	010800	
		010000	
	C PEGION 1 IS CLOSED.	010010	
		010030	
215	Y007(2)=0.0	010040	
	Y001 (3) = 0 • 0	056016	
	YO1 (4) #0°0 YO1 (4) #0°0 YO1 (5) #0 °0	010970	
	Y007 (5) =0.0	010940	
220	4V-CV-F-CV-F-CV-F-CV-F-CV-F-CV-F-CV-F-CV	010490	
	######################################	010110	
	YDOT (7) #-BH3* (YDOT (6) +YDOT (9) ) /V34	011020	
	YDOT (A) = C3+C3+YDOT (7) /60	011030	
225	IF (PP.GF.PJPS) Y101 (10) = (PP-PJPS) *A4.*60/PJT	011040	
	IP(PR.LT.PJPS)YD01(10)=0.0	011050	
		011070	

	YDOT (12) = YDOT (7) YDOT (13) = YDOT (8)	011080	
	AETUDA	011100	
	_	011110	
		021110	
	C REGION 4 IS OPEN.	011130	
		01110	
	Y001(2)=0.0	01110	
	Y007 (3) =0.0	011160	
	0-0-(4) 100>	01110	
	VD01751=0.0	011190	
		01110	
	1207 - 12	002110	
	SANTON TO TOTAL TANKS THE COLOR	0.0110	
	YD01 (A) = C3 = C3 = YD01 (7) / G0	012110	
	IF(BHD34.LE.0.n)YDOT(B)=YDOT(B)-AMD34*(H4-H3)*(GAM-1.0)/	011220	
	• (Val.Covers)	011230	
	Y001(9) # 49-147	011240	
;	17 (22,02,02,02,001(10)= (22,00)	011250	
	16 (PB-11-P-185) VDOT (10) = 0 + 0	011250	
	APJEYDOT (10) ( . 09814581, 0E7)	011270	
	T-GA = CC + ECC ×	011240	
	×DOT (12) == BH4+×DOT (9) / V4 + BMD34 / V4	011290	
	XDDT 1.1.1 = C + F C + F C   C   C   C   C   C   C   C   C   C	011300	
	/(0.[-MAR) + (+H=H=H=H=H=H=H=H=H=H=H=H=H=H=H=H=H=H=H=	011310	
		025110	
	**************************************	011330	
	XELUKN		
255	100 CONTINUE	011340	
	HALLES	011350	

PROPERTY DESCRIPTION OF THE PROPERTY OF THE PR

					•		•	رٰ :	•			-
•						1					:	
_		Strike	SUMPOUTIFIE	1000	1000	PURGRE (Not I Integrated to	116				01110	
		1110	TOISN:	DIMENSION Y (N) . YOUT (N)	2015	_		•			011340	
		1100	10N/EPC	CHY 6HO:	SED	OUSED.	MSTEP.	COMMON/EPCOM9/HUSED.NOUSED.NSTEP.1FE.NJE.NHI			011390	
		120	TATA A	COMMONITABILGO, GA11, COV. FRIFD, OFFCFT	5	V. FAIFD.	DEFE				1400	
•					20.00			-				
n				47 47 72	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \							
			011/18	13/0/5		A Lease	-	COMPOSITION OCCUPANT OF THE SERVICE			0/0110	
			TONITAR	COMMON/TEMP/PSTIPSTIPA/PHODI-MORUX-MOUVE	PSTR	AV. MOD	2464.1	×			011430	
		2000	PONITAR	15/C3,C	A MO	13.8MD.	34.2MD	3.R404.RM],	PM3.EM4.D	12170.101	011140	
		CO	PONITAR	16/11.	PS + SP	S.RH1.6	P1 . V 3 .	COMMON/TAP6/VI.VPS.SPS.RHI.PI.V3.RH3.P3.V4.VPJ.SPJ.APJ.DH4.P4	PJ.SPJ.AP	40.4Hd.U	011450	
-		20 CO	PONITAR	COMMON/TAR7/FJWT.TRAVEL	TRAV	1					011460	
		A CC	MAY/TAB	COMMON/TARA/PSRS.P. IRS.PI PR. DC34	P. HS	. PO . 19.	*DC34				011470	
		300	MATAB	10/FL 1.4	7.6.07	GALFRO	SEED	LEK GA . F. C. IM.	F 18, T		011480	
						27.00				4		
			740	10/14/10				COMMONN AND 07421-853-19 0-19 0-19 0-19 0-19 0-19 0-19 0-19 0	7 C 3 5 M C 8 5 M	* * * * * * * * * * * * * * * * * * * *	0.110	
			TONVIA	1117654	7.6	466.014	5 + K 4 A K	(10)			005110	
۲.		1100	ONITAB	112/wVE	72.17	FNT.AV	74.215	COFFON/TAB12/WVENT.NVENT.AVMIN.DVMAX.AK.ACS			011510	
		COME	COMMON/TAB13/PI	113/PI							011520	
		3	DN/TAR	COMMON/TABLE/DDB. ADP. BDB	ADP	ROB					011530	
		1	47.40	115/51		10.630	4000	COMMON TABLE OF 1 CT 1 CT 1 CT 1 CT 4 CEA DMG1 DMG1 DMG1 DMG1	A SMG - ASM		0 1 1 5 0	
			1	77777								
			VI /NO	JOYNAG.	L X . 5	30 77 6	4 4 1 E 4 6	COMPONITIONAL SAMESANDA PROPER SALLA PER LA PERLA PERL	•		064110	
50		N N N N N N N N N N N N N N N N N N N	MALVNO	117/463	7	VG VL	* + EPS 3	*FPS4			011560	
		100 100	TONITAR	118/01N	000.0	P(10)+	PMC3C1	COMMON/TAB18/DINC.PDDP (10).PML3(10).PMD3(10).PML4(10).PMD4(10)	. PML4 (10)	. PMD4 (19)	011570	
		Z	10N/TAR	COMMON/TARIO/STGMA.UIJ.WF	MA.U.	38.6					011580	
				10 10 10 10 10 10 10 10 10 10 10 10 10 1		20110		771 - 101 - 144	001.10114	COLUMN TARBETT STORY STO		
			JAI VNO	The Later			1	1166 (07 11 1	101 • 101	01010101010		
	U			******	*	*****	•				011600	
Ķ	U		9URNI	DRAPLET BURNING - CONSTANT	ATSI-C	HT SIZE		DHOPLETS			011510	
ì					***	*****	****	******			011620	
	, د				9507						0110	
	U		ביי סיי	VOLISHE OF LIBUID CHAMBER.	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1						054110	
		V)=V(1)	3								011540	
	U	PISTON VELOCITY.	VELOCI	TY.							011650	
30	,		(2)								011560	
,		16 (14	100	TE (MOD) FO DIVESTO	0,0						011670	
	•	9	TOAVE	•	•						011480	
	ر		1 M M M M M M M M M M M M M M M M M M M								2007110	
			SPS=7 (3)								046110	
	ပ	10	DENSI1	•							01110	
35		# Lig	DI]#4 (4)								011110	
	U	110	DOFSEL	RE.							011720	
	,			•							011710	
		1111		16 17 17 17 17 17 17 17 17 17 17 17 17 17	٠						1140	
				- 1 4 6 9 9								
	ပ	ב כ		COMBUSTION CHAMBER	VIII	MRER.					011750	
04		V3=Y (6)	(9)								011760	
	U	DENSITY IN COMBUSTION CHAMBER	DO ZI	MBUSTIC	S	AMBED.					011170	
		HEHO	BH3=Y(7)								011780	
	•	PDF	21	TANKE T	O NO	HAMBED.					011790	
	•				,						011800	
,	•	5	01.1.								01110	
Ç	J		5	•								
			?									
	U		TEVE	LOCITY							011430	
			VPJ=Y (10)								01140	
	U	PPO	TLE TR	AVEL							011950	
ů.		SPJ#	SPJ=Y(11)								011840	
	U	DENSITY IN TUBE	IN TU	BE							011979	
		RAHE	RH4=Y (12)								0 1 1 A 8 0	
	C	AVEDAGE PRESSURE IN THE TURE.	PRESS	URE IN	THE	TUPE.					011990	
	,	04=V111	1513		!	:					0 11 90 0	
u			0 C N C T T	Y TAI OF	14019	į,					01110	
, ,	ı		1 1 1 1 2 C 1 1 C								. 6	
	•				•						0110	
	U	LIGHTS MASS IN	1 054	7010 in 1	• •						261112	

		011040	
	C LIGHTO DENSITY IN REGION 4.	011950	
•	171777	411040	
	The state of the s		
	C CIGGIO MASS In this is		
	BML4=Y(17)	011940	
	C FIND THE DISCHARGE COEFFICIENT.	0 1 1 0 9 0	
	TELEVISION OF THE POST	01200	
1	1.000		
t,		010210	
	C FIND THE DISTOR DESISTANCE POESSUPE.	012020	
		050510	
	C FIND THE PROJECTILE RESISTANCE PACSSONE.	010010	
	CALL PROJRES(2.SPJ.PJPS)	012050	
10	1 CA 1	012040	
2			
	IN CLOSEN CENTRAL CONTROL OF CONTROLS	0/0710	
	יכארר	0125A0	
		000210	
		01210	
		001210	
74	C VL3 IS THE LIQUIN VALUME OF REGION 3.	011210	
	VL3=PML3/RHL3	012120	
	NOT THE CAR VOLLING IN OFFICE A	012130	
		01710	
	C FPS3 IS THE POROSITY IN REGION 3.	012150	
	CAYCOA+C305	012160	
0,5	CA/5045043	001710	
	C RMG3 IS THE GAS DENSITY IN REGION 3.	01210	
		012190	
	9	01210	
	##G3##################################	0.02210	
3.5	C BH3 IS THE MASS IN REGION 3.	012210	
•	C ING 1 CHG CHG	012220	
	MORDED SO SMITTON ATTIONS THE SECOND	012210	
		0 0 0 0 0 0	
	C VG4 1S THE GAS VOLUME IN REGION 4.	012250	
6		012260	
;	NOTOR BO STATE OF THE	012370	
	C EPSA IS THE PORTS IT OF REGION 4.		
	EPS4=EPS3	082210	
	IF (V4.GT.).0E-4)EPS4#VG4/V4	012290	
	200	012300	
1	POTOUR DO LITERATO CAR DEL CT ADEL		
<b>.</b>	•	016.510	
	C BEGF IN THE GAS LASS IN REGION 4.	012320	
	DMG4 = DMG 4 = VG4	012330	
	TO CONTRACT OF THE PARTY OF THE	2326	
	C XII IN THE IN THE ION A.	0.000	
	RM4=RMG4+BML4	016310	
202	C MESSE IN THE TOTAL MASS	012360	
		012370	
	C PRESSURE AT BASE OF PRUJECTILE.	v	
	((LETG+0°M) \420+0°M)\((LETG+0°M)\450+040)HGG	012390	
	15 (00 1 T 0 10 C 0 D 0 C	n	
104		016210	
	PL=PR+(1.0+RM4/(2.0+PJW1)) - PJR5+RM4/(2.0+PJW1)	07.510	
	15 (DD 1 1 DJR) DL # D4	012430	
	INTERNAL FREEDRY DEED GRAM FOR GAR IN DESTON 3	012440	
	TOTAL DESCRIPTION OF THE PROPERTY OF THE PROPE	u I	
·	C AVEDAGE INTERNAL ENERGY PER RAM FOR GAS IN WESTON 4.	012450	
	#FFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF	n12470	
	TO TO TO TO TO	012490	
	<b>7</b> a=' d	069210	
	# C H U C	012500	
	3 1 1		

PAGE	
N2/22/45 13.15.44	•
02/22/85	
FTN 4.8.401	
OPT=1 JOHND=+-4/ TOACF	
74/76	
SURBOUTINE FOROP?	

:		:
117	SO CONTINUE TO THE CONTINUE THE COMPLICATION CHANGED GAS.	015210
	CG3=SDPT(GO*GAM*P3/((1.0-COV**MG3)*RR3))	012510
	C CG4 IS THE SPEED OF SOUND IN THE TURE GAS.	012540
120	C CLI IS THE SPEED OF SOUND IN THE LIGUID CHAMBER.	012540
	CL1=SQPT(60*(PK]+RK2*P1)/RH1)	012570
	C CL3 IS THE SPEED OF SOUND IN THE LIGHTD IN REGION 3.	012540
	=SQRT(60*(PK]+RK2*P3)/RHL3)	012590
	C CL4 IS THE SPEED OF SOUND IN THE LIGHID IN REGION 4.	
125	(]+RK2*P4)/RHL4)	012410
	C C3 IS THE MIXTURE SPEED OF SOUND IN REGION 3.	012620
	C3=SORT(1.0/(RM3*(EPS3/(RHG3*CG3*CG3) ·	012630
	+ (1.0-EPS3)/(RML3*CL3*CL3)))	012640
	C C4 IS THE MIXTUPE SPEED OF SOUND IN PEGION 4.	012650
130	C4=SQRT(1.0/(RH4+(EPS4/(RHG4+CG4+CG4) +	
	.n-EPS4)/(RHL4*CL4*CL4)))	012570
	C RWD13 IS THE MASS FLUX FROM REGION 1 TO REGION 3.	0125A0
	0Lp=p1-p3	012690
•	TOTAL	1012700
135	17 (DEFICIAL OF A DEFICIAL OF	01270
	IT (DE GET OF OF DE DE DE CONTRACTOR DE CONT	02/210
	IF (MODI = EQ=0) RMOI 3=0=0	012730
	C LIMIT INJECTION VELOCITY INTO REGION 3.	016740
		012750
140	C WERER NIMMER	012760
		012770
	C RMD34 IS THE MASS FLUX FROM REGION 3 TO REGION 4.	012740
	0.LP=P3—PL	
	IF (DLP.LT.0.0) PMD34=-DC34+A4*SGRT(-2.0+RH4*G0*DLP)	
145	IF(nlp.ge.o.o) RMD34=DC34=A4=SGRT(2.0=RH3=G0=flp)	018210
	IF (MOD4.E0.0) RMD34=0.0	012920
	C ELI IS THE TOTAL ENERGY IN PEGION 1.	012930
	EL1=ENER+RM1	012840
	C EL3 IS THE LIQUID ENERGY IN REGION 3.	012850
150	EL3=ENEP+RML3	012860
	C EG3 IS THE TOTAL INTERNAL GAS ENERGY IN PEGION 3.	012970
	EG3#ENERG3	012480
	C FLA IS THE LIQUID ENERGY IN REGION 4.	000000
991	P NOTED IN AUDING ONE STREET OF THE STREET OF THE STREET	012210
	FGA-FNFGA-BOAGA	01200
	C EKPS IS THE MINETIC ENERGY OF THE PISTON.	012930
	EKPS#0.5+PSHT+VPS+VPS/G0	012940
	C EMPJ IS THE MINETIC ENEGGY OF THE PROJECTILE.	012950
140	ERPL=0.5+PJWT-vVPJ/G0	012960
	EKG4 IS THE KINETIC ENEPGY	
	ASSUME THAT THE DENSITY IS CONSTANT.	
	SSUME THAT THE VELOCITY IS A LINEAR FUNCTION.	~
	SO	-
145		-
	IF (MnD4.FO.0) Gn 10 32	013020
		01 4030
130	FERNANCE CONTRACTOR OF THE PROPERTY OF THE PRO	
	A MARIA TARAFA A SANTA PARA MARANA MA	013070
	CV - 12	

2 2 (CONTINUE C.	N MUUUUUUU	CONTINUE	013170 013120 013120 013130 013140
C ESIM STATE SUM OF THE CARREST STATES OF THE STATES OF TH			013120 013120 013130 013140
TEMPORATION   TOTAL	0 0 0 0 0 0	SIGN OF THE ENERGIES.	013120 013130 013140 013150
TEMPS 15 THE GAS TRAMPERATURE IN REGION 4.  TEMPS 27 11,00000000000000000000000000000000000		34 +EKL	013130 013140 013150
TEMPS 12 TEMPS 40 TEM	0 0 0 0 0	EMP3 IS THE GAS TEMPERATURE IN REGION 3.	013140
C TEMPA IS THE AVERAGE ASS TEMBERAINE IN PEGION 4.  TEMPARADA IL CONVANIGATION OF THE LIGUID IN PEGION 4.  H.1 IS THE ENHALPY OF THE LIGUID IN PEGION 4.  H.4 IS THE ENHALPY OF THE LIGUID IN PEGION 4.  H.4 SEEPE PARADA OF THE LIGUID IN PEGION 4.  H.4 SEEPE PARADA OF THE LIGUID IN PEGION 4.  H.4 SEEPE PARADA OF THE GAS IN PEGION 4.  H.4 SEEPE PARADA OF THE LIGUID IN PEGION 4.  H.4 SEEPE PARADA OF THE LIGUID IN PEGION 4.  H.5 CENATION.  C ASSUUE THAT THE ENTANCY OF THE LIGUID TO GAS IN PEGION 3.  IF CHOOSE TERMA OF THE GAS CANNOT FLOW FROW PEGION 4.  PRODER THAT THE GAS CANNOT FLOW FROW PEGION 4.  PRODER THAT THE GAS CANNOT PLOW FROW PEGION 4.  IF CHOOSE THE ALT OF CHANGE OF LIGUID TO GAS IN PEGION 4.  PRODER THAT THE GAS CANNOT PLOW FROW PEGION 4.  IF CHOOSE THE ALT OF CHANGE OF LIGUID TO GAS IN PEGION 4.  IF CHOOSE THE CANNOT TO 1.0  C ROOSE TE SOLOHUM TO 1.0  C ROOSE TE SOLOHUM TO 1.0  E PEGION 1 IS OPEN.  IF CHOOSE CAS CANNOT TO 1.0.  FOR THE THAT THE CANDOT TO 1.0.  IF CHOOSE THE CANDOT TO 1.0.  FOR THE THAT THE CANDOT TO 1.0.  IF CHOOSE TE CONTINUE TO 1.0.  IF CHOOSE THE CANDOT TO 1.0.  IF CHOOSE THE CHOOSE THE CONTROL TO 1.0.  IF CHOOSE THE CHOOSE THE CHOOSE THE CONTROL TO 1.0.  IF CHOOSE THE CHOOSE THE CHOOSE THE CONTROL TO 1.0.  IF CHOOSE THE CHOOSE THE CHOOSE THE CONTROL TO 1.0.  IF CHOOSE THE CHOOSE THE CHOOSE THE CHOOSE THE CONTROL TO 1.0.  IF CHOOSE THE C	0 0 0 0	TFMD3=P3=(1, 0-CC)+44H63)/(PH63+(484-1, 0)+CV)	013150
TEMPARADA   THE LIGHTON   THE COUNTY			
C HI IS PREVENTINGON THE LIGHTON BEGING 1.  HI IS THE FUHLARY OF THE LIGHTON BEGING 4.  HI IS THE R. PALPHLY OF THE LIGHTON BEGING 4.  HA IS THE ENHARY OF THE LIGHTON BEGING 4.  HA IS THE ENHARY OF THE GAS IN REGION 3.  HAS CONTRIBED - PASCOV THE GAS IN REGION 4.  C HA IS THE ENHARY OF THE GAS IN REGION 4.  C HA IS THE ENHARY OF THE GAS IN REGION 4.  C HAS IS THE ENHARY OF THE GAS IN REGION 4.  C SSUME THAT THE GAS CANNOT FLOW FROM BEGING 4.  IF GROUD THE ATTE OF CANNOT FLOW FROM BEGING 4.  C ROSINET THE ATTE OF CANNOT FLOW FROM BEGING 4.  IF GROUD THE ATTE OF CANNOT FLOW FROM BEGING 4.  C ROSINET THE ATTE OF CANNOT FLOW FROM BEGING 4.  IF GROUD THE ATTE OF CANNOT FLOW FROM BEGING 4.  C ROSINET THE ATTE OF CANNOT FLOW FROM BEGING 4.  IF GROUD THE ATTE OF CANNOT FLOW FROM BEGING 4.  RROJS STATE THE ATTE OF CANNOT FLOW FROM BEGING 4.  IF GROUD THE ATTE OF CANNOT FLOW FROM BEGING 4.  IF GROUD THE ATTE OF CANNOT FLOW FROM BEGING 4.  IF GROUD THE ATTE OF CANNOT FLOW FROM BEGING 4.  IF GROUD THE ATTE OF CANNOT FROM BEGING 5.  IF GROUD THE ATTE OF CANNOT FROM BEGING 5.  IF GROUD THE ATTE OF CANNOT FROM BEGING 5.  IF GROUD THE ATTE OF CANNOT FROM BEGING 5.  IF GROUD THE ATTE OF CANNOT FROM BEGING 5.  IF GROUD THE ATTE OF CANNOT FROM BEGING 5.  IF GROUD THE ATTE OF CANNOT FROM BEGING 5.  IF GROUD THE ATTE OF CANNOT FROM BEGING 5.  IF GROUD THE ATTE OF CANNOT FROM BEGING 5.  IF GROUD THE ATTE OF SAME SAME SAME SAME SAME SAME SAME SAME			
C HI IS THE ENHALPY OF THE LIGATIO IN PECIFY 1.  H. 13 FHE ENHALPY OF THE LIGATIO IN PECIFY 3.  H. 3 ENHER ENHALPY OF THE LIGATION A.  H. 4 IS THE ENHALPY OF THE GAS IN PECIFON A.  H. 4 ENHALPY OF THE GAS IN PECIFON A.  H. 5 FHE ENHALPY OF THE GAS IN PECIFON A.  H. 5 FHE ENHALPY OF THE GAS IN PECIFON A.  H. 5 FHE ENHALPY OF THE GAS IN PECIFON A.  C ASSUME THAT THE GAS CANNOT FLOW FROM PECIFON A. TO REGION A.  FROM THAT THE GAS CANNOT FLOW FROM PECIFON A.  FROM THAT THE GAS CANNOT FLOW FROM PECIFON A.  RADDALET FORMATION.  C RUGH IS THE RATE OF CHANGE OF LIQUID TO GAS IN PECIFON A.  FROM THE GAS CANNOT FLOW FROM PECIFON A.  FROM THE GAS CANNOT FLOW FROM THE GAS IN PECIFON A.  FROM THE GAS CANNOT TO 1.60  FROM A IS OPEN.  FROM THE GAS CANNOT TO 1.60  FROM A IS OPEN.  FROM THE GAS CANNOT TO 1.60  FROM A IS OPEN.  FROM THE GAS CANNOT TO 1.60  FROM THE GAS CANOT TO 1.60  FROM THE GAS CANNOT TO 1.60  FROM TH		(AD) (2011200) (2017) (2017) (2017) (2017) (2017)	01210
H_1=FWEP	0 0 0	I IS THE FATHALPY OF THE LIGUID IN PEGIOM I.	013170
C H.3 IS THE EXTMALEY OF THE LIDUID IN REGION 4.  H.L. STREE FOTHALLEY OF THE LIDUID IN REGION 4.  H.L. STREE ENTHALEY OF THE GAS IN REGION 4.  H.L. STREE ENTHALEY OF THE GAS IN REGION 4.  H.L. STREE ENTHALEY OF THE GAS IN REGION 4.  H.L. STREE ENTHALEY OF THE GAS IN REGION 4.  H.L. STREE ENTHALEY OF THE GAS IN REGION 4.  C ASSUME TAD THIT THE GAS CANNOT FLOW FROM PEGIN 4. TO REGION 3.  IF RPODLET FORD A. LT. 0.0 PROJAGO OF LIDUID TO GAS IN REGION 3.  IF RPODLET E. O.	0 0 0	HT]=ENED + DI/DH]	013180
## ## ## ## ## ## ## ## ## ## ## ## ##	, <b>,</b> ,		091519
C HLA IS THE ENTHALPY OF THE LIGHID IN PEGION 4.  H.ASENER - PACPHLA  C H3 STREE ENTHALPY OF THE GAS IN REGION 3.  H.ASENER - PACPHLA  C H4 IS THE ENTHALPY OF THE GAS IN REGION 4.  H.ASENER - PACCON  C H4 IS THE ENTHALPY OF THE GAS IN REGION 4.  C BASQUET THAT THE OF CHANGE OF LIGHID TO GAS IN PEGION 3.  FROD STATE RATE OF CHANGE OF LIGHID TO GAS IN PEGION 3.  FROD STATE RATE OF CHANGE OF LIGHID TO GAS IN PEGION 4.  FROD STATE RATE OF CHANGE OF LIGHID TO GAS IN PEGION 4.  FROD STATE RATE OF CHANGE OF LIGHID TO GAS IN PEGION 3.  FROD STATE RATE OF CHANGE OF LIGHID TO GAS IN PEGION 4.  FROD STATE RATE OF CHANGE OF LIGHID TO GAS IN PEGION 4.  FROD STATE RATE OF CHANGE OF LIGHID TO GAS IN PEGION 4.  FROD STATE RATE OF CHANGE OF LIGHID TO GAS IN PEGION 4.  FROD STATE RATE OF CHANGE OF LIGHID TO GAS IN PEGION 4.  FROD STATE RATE OF CHANGE OF LIGHID TO GAS IN PEGION 4.  FROD STATE RATE OF CHANGE OF LIGHID TO GAS IN PEGION 4.  FROD STATE RATE OF CHANGE OF LIGHID TO GAS IN PEGION 4.  FROD STATE RATE OF CHANGE OF LIGHID TO GAS IN PEGION 4.  FROD STATE RATE OF CHANGE OF LIGHID TO GAS IN PEGION 4.  FROD STATE RATE OF CHANGE OF LIGHID TO GAS IN PEGION 4.  FROD STATE RATE OF CHANGE OF LIGHID TO GAS IN PEGION 4.  FROD STATE RATE OF CHANGE OF LIGHID TO GAS IN PEGION 4.  FROD STATE RATE OF CHANGE OF LIGHID TO GAS IN PEGION 4.  FROD TO GAS STATE OF CHANGE OF LIGHID TO GAS IN PEGION 4.  FROD TO GAS STATE OF CHANGE OF LIGHID TO GAS IN PEGION 4.  FROD TO GAS STATE OF THE CHANGE OF C	ပပ		000000
C H4 IS THE ENTRALPY OF THE LIGHTD IN DEGION 4.  H4 = EVER ENTRALPY OF THE GAS IN REGION 3.  H4 = EVER ENTRALPY OF THE GAS IN REGION 4.  H5 = EVERTHALL PY OF THE GAS IN REGION 4.  H5 = EVERTHALL PY OF THE GAS IN REGION 4.  C SSUME THAT THE GAS CANNOT FLOW FROW REGION 4 TO REGION 3.  ENDSTELT FORMAL PY OF THE GAS CANNOT FLOW FROW REGION 4.  C AND IS THE RATE OF CHANGE OF LIDUID TO GAS IN REGION 3.  RHOS = RHOS = RHOS = RHOR =	ပ ပ		2016
1   1   1   1   1   1   1   1   1   1			013210
C H3 THE ENTHALPY OF THE GAS IN REGION 3.  H=CP=TENTALPY OF THE GAS IN REGION 4.  C H4 IS THE ENTHALPY OF THE GAS IN REGION 4.  C DROBLET FORMATION.  C ASSUME THAT THE GAS CRANDT FLOW FROM PEGION 4 TO RECATON 3.  RMD3.ALT.O.O.D.PMD3.ACO.O.O.O.O.O.O.O.O.O.O.O.O.O.O.O.O.O.O			013220
HACCPSTEMALPY OF THE GAS IN REGION 4.  ***CPATERIAL PACON THE GAS IN REGION 4.  ***CPATERIAL PACON THE GAS IN REGION 4.  C ASSUME THAT THE GAS CANNOT FLOW FROM PEGION 4. TO REGION 3.  IF REPOBLET OF CHANGE OF LIDUID TO GAS IN REGION 3.  IF REPOBLET OF CHANGE OF LIDUID TO GAS IN REGION 4.  RHOJSTRIALS (4.0.7001) 2000 TO 10.  C RHOD, IS THE RATE OF CHANGE OF LIDUID TO GAS IN REGION 4.  RHOJSTRIALS (4.0.7001) 2000 TO 10.  C RHOD, IS THE RATE OF CHANGE OF LIDUID TO GAS IN REGION 4.  PROFISE THE RATE OF CHANGE OF LIDUID TO GAS IN REGION 4.  PROFISE THE RATE OF CHANGE OF LIDUID TO GAS IN REGION 4.  PROFISE THE RATE OF CHANGE OF LIDUID TO GAS IN REGION 4.  PROFISE THE RATE OF CHANGE OF LIDUID TO GAS IN REGION 4.  PROFISE THE RATE OF CHANGE OF LIDUID TO GAS IN REGION 4.  PROFISE THE RATE OF CHANGE OF LIDUID TO GAS IN REGION 4.  PROFISE THE RATE OF CHANGE OF LIDUID TO GAS IN REGION 4.  PROFICE TO TO 10.0 TO 10.0  PROFICE TO TO 10.0 TO 10.0 TO 10.0  PROFICE TO TO 10.0 TO 10.0 TO 10.0 TO 10.0  PROFICE TO TO 10.0 TO 10.0 TO 10.0 TO 10.0  PROFICE TO 10.0 TO 10.0 TO 10.0 TO 10.0 TO 10.0  PROFICE TO 10.0 TO 10.0 TO 10.0 TO 10.0 TO 10.0 TO 10.0  PR		IS THE ENTHALPY OF THE GAS IN REGION	013230
C H4 15 THE ENHALPY OF THE GAS IN REGION 4.  ***********************************			013240
C ASSUME THAT THAT THAT TOWN TO THAT THE ASSOCIATION AND ASSOC		SAC TN DEGTON	011250
C DROOLET FORMATION.  C DROOLET FORMATION.  C C SSOURE THAT THE GAS CANNOT FLOW FRON PEGION 4 TO REGION 3.  IF (RPD34_LT_0.0)PM034=0.0  C RW03 IS THE RATE OF CHANGE OF LIQUID TO GAS IN PEGION 3.  RH03=RML3+6.0/DDR) +ADR+(P34-8DR)  C RW03 IS THE RATE OF CHANGE OF LIQUID TO GAS IN PEGION 4.  RH03=RML3+6.0/DDR) +ADR+(P34-8DR)  C RW03 IS THE RATE OF CHANGE OF LIQUID TO GAS IN REGION 4.  IF (MD01_G.0.050 TO 150  IF (MD01_G.0.050 TO 140  C REGION I IS OPEN.  FORCA=039 +43 +ARCHT) - P1+(A1-AVCHT)  FORCA=039 +43 +ARCHT) - P1+(A1-AVCHT)  FORCA=039 +43 +ARCHT(1) = G0 PS4T) + FORC.  FORCA=049 +43 +ARCHT(1) = G0 PS4T) + FORC.  FORCA=049 +43 +ARCHT(1) = G0 PS4T) + FORC.  FORCA=049 +43 +ARCHT(1) = G0 PS4T) + FORC.  FORCT(4) = RM13 + VORT(1) + VORT(4) = RM13 + V3  FORT(4) = RM13 + VORT(4) = RM13 + V3  FORT(4) = RM13 + VORT(4) = RM13 + V3  FORT(4) = RM13 + VART(1) + RM13 + V3  FORT(4) = RM2 + RM11 + VART(1) = RM2 + V3  FORT(4) = RM3 + RM11 + VART(1) = RM2 + V3  FORT(4) = RM3 + VART(1) = RM3 + VART(4) + VART(4) + VART(4) = RM3 + VART(4)	,	1011111 11 CHO	•
C SSUME THAT THE GAS CANNOT FLOW FROM PEGIOM 4 TO REGION 3.  C ASSUME THAT THE GAS CANNOT FLOW FROM PEGIOM 4 TO REGION 3.  If GRPD34_LT 0.0 IPHODAE 0.0  If GRPD34_LT 0.0 IPHODAE 0.0  RH03 IS THE RATE OF CHANGE OF LTOUID TO GAS IN REGION 4.  RH03 HALS THE RATE OF CHANGE OF LTOUID TO GAS IN REGION 4.  RH04 LS THE RATE OF CHANGE OF LTOUID TO GAS IN REGION 4.  RH04 LS OF CHANGE OF LTOUID TO GAS IN REGION 4.  RH04 LS OF CHANGE OF LTOUID TO GAS IN REGION 4.  If GHOD1.EQ. 0160 TO 150  If GHOD1.EQ. 0160 TO 140  C REGION 4 IS OPEN.  YOUT 13 SPEN.  IF (TYENTI) ED. 10HYENT3 1YOUT (1) *VOOT (1) *VCOP  FORESPESSES ALL AAVENT)  IF (TYENTI) ED. 10HYENT3 1FORESPESSE (ALAHOLE)  IF (TYENTI) ED. 10HYENT3 1FORESPESSE (ALAHOLE)  IF (FORC.EG. FORRY YOOT (2) *CO.0) YOOT (2) *CO.0  IF (FORC.EG. FORRY YOOT (2) *CO.0) YOOT (3) *CO.0)  IF (FORC.EG. FORRY YOOT (2) *CO.0) YOOT (3) *CO.0)  IF (FORC.EG. FORRY YOOT (2) *CO.0) YOOT (3) *CO.0)  IF (FORC.EG. FORRY YOOT (3) *CO.0) YOOT (4) *CO.0)  IF (FORC.EG. FORRY YOOT (3) *CO.0) YOOT (4) *CO.0)  YOOT (3) *CO.0) *CO.0) *CO.0) *CO.0) *CO.0)  YOOT (4) *CO.0) *CO.0) *CO.0) *CO.0) *CO.0)  *CO.0) *CO.0) *CO.0) *CO.0) *CO.0) *CO.0) *CO.0)  *CO.0)	•		" •
C DRODLET FORMATION.  C DROOLET FORMATION.  C RASSUME THAT THE GAS.  I F RAPE OF CHANGE OF CHANGE OF LIQUID TO GAS IN PEGION 3.  RHD3=RHQ3=FG.070R) = AGR-FGP3=BDR)  C RHQ IS THE RATE OF CHANGE OF LIQUID TO GAS IN PEGION 4.  RHD3=RHQ3=FG.070R) = AGR-FGP3=BDR)  C RHQ IS THE RATE OF CHANGE OF LIQUID TO GAS IN REGION 4.  IF (MOD1.EQ.0160 TO 150  IF (TVENTI) = CO.10HVENT3			013570
C ASSUME THAT THE GAS CANNOT FLOW FROM REGION 4 TO REGION 3.  RM03 IS THE RATE OF CHANGE OF LIDUID TO GAS IN REGION 4.  RM03 FRIL 30 (0.0000) 40R0 60R 1 10 10 10 10 10 10 10 10 10 10 10 10 1		NOPLET FORMATION.	013240
F(RPCD3.LT.0.0)RM034=0.0   C		THAT THE GAS CANNOT FLOW FROM REGION 4 TO REGION	013290
C RW03 IS THE RATE OF CHANGE OF LIQUID TO GAS IN REGION 3.  RW03-RW13-RW13-RW13-RW13-RW13-RW13-RW13-RW1			005610
C RNO4 IS THE RATE OF CHANGE OF LIDUID TO GAS IN REGION 4.  RHD3=RHL34(6.00DR) * ADREPED3***********************************	,		
RMD-=RM_16 (6.0) FORDR = ADR = (P30-8DR)  C RMO4 IS THE RATE OF CHANGE OF LIQUID TO GAS IN REGION 4.  RHD4.RL4 (6.0.0) FO TO 150  IF (HODD1.60.0) GO TO 140  C REGION 1 IS OPEN.  C REGION 4 IS OPEN.  C REGION 4 IS OPEN.  YOUT 1) = VPS = 11  IF (TVENTI) = CO.10 HVENT3	U	TO GAS IN PEGION	013310
C RRD4 IS THE RATE OF CHANGE OF LIQUID TO GAS IN REGION 4.  RRD4ERWLAG6.070R919ADR*CP4***********************************		RMD3=RML3 = (6.0/00R) + AOR + (P3++80R)	013320
Figure   F		TO GAS IN DESTON	01330
F(MODA.EG.01)   F(MODA.EG.01		NOTICE ALL CAR OF	
		XED4#X14+60.0/UTX   IDX   (Y41+1UT)	012340
		IF (MODI.EQ.0)60 TO 150	013350
C REGION 1 IS OPEN.  FORCEPS: 43-AVENT)  FORCEPS: 41-AVENT)  FORTE SETTING  FORCEPS: 41-AVENT SETTING  FORTE SETING  FORTE SETTING  FORT SETTING  FORTE SETTING  FORTE SETTING  FORT SETTING	00	IF (MOD4_E0_0) 60 TO 140	013360
FEGION 4   15 OPEN.	•	MUSC OF TOOLS	013370
FUTURE   STATE   STA			
F(TVENT(1) = FO. 10 + VENT3		* ZUL 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	000010
F(TVENT(1) = C_0   OHVENT3			013340
FORCEP3*(43.4VENT) - P1*(41-4VENT)  FORREPSPS*(41-4VENT)  FORREPSPS*(41-4VENT)  IF (TVENT(1).ED.10HVENT3  IF (TVENT(1).ED.10HVENT3  IF (TORC.GE.FORP) YDOT(2) = (60/PS4T)*(FORC.FOR9)  IF (FORC.LT.*FODP) YDOT(2) = (60/PS4T)*(FORC.FOR9)  IF (FORC.LT.*COPP) + (60/PS4T)*(FORC.FOR9)  YDOT(4) = (60/PS4T)*(FORC.FORP) + (60/PS4T)*(FORC.FORP)  YDOT(5) = (60/PS4T)*(FORC.FORP) +		/ENT3	013400
FORR=PSPS=(A1-AVENT)  FORR=PSPS=(A1-AVENT)  IF (TVENT(1) = Cn. 10HVENT3  IF (FORC_LT.FOPA) YD07(2) = (G0/PSWT) = (FOPC_FORP)  IF (FORC_LT.FOPA) YD07(2) = (G0/PSWT)	50	•	
If TVENT (1) = LO = 10 HVENT 3			
If (TVENT(11).EG.10HVENT3   FORR=PSRS*(Al-AHOLE)   DI     If (FORC_GE_FORR) YOOT (2) = (GO/PS4T) * (FORC_FORR)     If (FORC_LT.O*O*O) YOOT (2) = (GO/PS4T) * (FORC_FORR)     If (FORC_LT.O*O*O) YOOT (2) = (GO/PS4T) * (FORC_FORR)     If (SPS.LT.O*O*AND.YOOT (2) * LT.O*O) YOOT (2) = 0.0     If (SPS.LT.O*O*AND.YOOT (2) * LT.O*O) YOOT (3) = 0.0     YOOT (4) = -PRH 1 * YOOT (4) / GO     YOOT (5) = CL1 * YOOT (4) / GO     YOOT (5) = CL1 * YOOT (4) / GO     YOOT (5) = CL1 * YOOT (4) / GO     YOOT (7) = -PRH 3 * YOOT (4) / GO     YOOT (7) = -PRH 3 * YOOT (6) / V3			013430
			0 3440
If FORC.LE.FINED TIME   CONTROLLED   CONTROLLED		, , ,	
		1 ( LONG - C L L L L L L L L L L L L L L L L L L	0000
If (FORC.LT.0.n) YDOT(2) = (60/PSWT) = FORC	02	IF (FORC.LT.FORM) YDOT (2) = 0.0	013460
		TE (EDD)   1 - 0 - 0 - VDO 1 (2) = (50 / DO NT + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 +	013470
T			
		Y001 (3) = VPS	013640
		TF <p>&lt;- T = 0.0 - AND = Y00T &lt;21 - [T = 0 = 0 + Y00T &lt;21 - [T = 0 = 0 + Y00T &lt;21 + Z = 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0 = 0 =</p>	013490
		C C	0.000
VDOT(5)==PH]=YDDI(1)/VI - RMD]3/VI  VDOT(5)=VPS=A]  YDOT(5)=VPS=A]  IF(TVENT(1)-EA.10HVENT3 )YDOT(5)=VDOT(6)-VCOR  YDOT(7)=-PH3=YNOT(6)/V3 + RMD]3/V3 - RMD]3/V3 - O1  YDOT(7)=(RH3=V3-C3-C3-C3-C0) • (-YDOT(6)-V3 + RMD]3/V3 - O1  YDOT(7)=(RHM13-V3) + (RMD]3/V3 + O1  + (I_0 - RHG3/VPHL3 + GP=(HL3+V3) + (RMM-I_0)/  + (GG=GG3=(1.0-GN**-H3)) - RMD]3/PM*-1  YDOT(9)=VPS-YR + GP=(HS) + O1  IF(PD=GE-DPS)YNOT(10)=(PD=PJRS)**-LA**-CAMT  IF(PD=LT_*-DPS)YNOT(10)=0.0		TOTAL CONTRACTOR OF THE CONTRACTOR CONTRACTO	
YOOT(5) #CL1 *CL1 *CDT(4) / GO  YOOT(5) # VESA 3  YOOT(7) # VESA 3  YOOT(7) # VEB 4 CA 10 WENT3  YOOT(4) # (RH 3 * CA 2 CA 6) # ( * CA 10 CA		YDOT(4)=-PH10YDOT(1)/V1 - RM013/V1	013210
VDOT(6) = VPS = A3 VDOT(7) = VPS = A3 IFTTVENT(1) = FG.104VENT3		XDO1.57.20 100 10 XDO1.00	013520
FOURDINGS   VOUTO			
IF(TVENT(1).Eq.10HVENT3		TD01 (6) ≅VPS *A3	0 4 6 5 7 6
YOOT(T)=-PM3=YNOT(6)/V3 + RMD13/V3 -RMD34/V3 YDOT(T)=(RM2=V3-C3/G0) = (-YDDT(6)/V3 + - PMD13/(RML3=V3) = (RMD13/V3) + - (L0 - PM3-V3) = (RMM-1, 0)/ - (CG1*CG3*(1, 0, 0, 0, 0, 0, 0, 0, 0)) YDOT(9)=VPJ*A*    YDOT(9)=VPJ*A*   F(PP.GF*PJPS)*YNOT(10)=0, 0   F(PP.GT*PJPS)*YNOT(10)=0, 0   APJ=YDOT(10)*C*O941*0*E10; 0; 7)			013540
VDOT(T) = (RM3-C3-C3-G0) = (-Y00T(6)-V3 - 01  + PwD13/(RM13-V3) + (RMD3/(RM6-V3)) = (-10 - RM13-V3) + (RMD3/(RM6-V3)) = (-10 - RM63/CML3 + G0-(HL3-M3) + (RM-1.0)/  + (L0 - RM63/CML3 + G0-(HL3-M3) + (RM-1.0)/  + (L0 - RM63/CML3 + G0-(HL3-M3) + (RM-1.0)/  + (RM-CG3-(1, -10 - 0.0) + (RM-1.0)/    F		9	013550
TOT (R) = (RH 3 = C = C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C 3 < C	•		
+ D4013/(RHL34V3); + (RH03X/(RHG34V3); + (RG)+RHG34V4); + (RG)+RHG3+CQ+L13-H3)+ (RAM-1,0)/ (CG)+RG3+CQ+L13-H3-H3-H3-H3-H3-H3-L3-L3-L3-L3-L3-L3-L3-L3-L3-L3-L3-L3-L3	20	1001(m) = (mx3=C3=C3+C3+C3) = (=1001(e)/A3	096610
• (1.0 = PMG3/PHL3 • 50@(HL3-H3) • (GAM-1.0)/ • (CG3*CG3*(1.0~CNV*PMG3))) • PMD34/PM3) • (CG1*CG3*(1.0~CNV*PMG3))) • PMD34/PM3) • (FOP.GF*CD3*) • (FOP.PDA*) • E4*G0/PDMT • (FOP.GF*CDA*) • (FOP.PDA*) • E4*G0/PDMT		P40137	013510
+ (CGJ*CGG*(1.0~CNV*DHG3))) - RMO34/P43) YOOT(9) *VPJ*A*    TE (PD*GF*PJPS) *VOT(10) = (PD*PJRS) *E4*GP/PJWT   F (PD*LT*PJRS) *NOT(10) = 0.0   APJ*VOT(10) * (.094]************************************		RHG3/0HL3 + GO+(HL3-H3)+(GAM-1.	0135R0
VOICT (9)			002560
TOTATES TO THE TOTATE TO THE T			
		401(4)100	104611
010	20	IF (DD. GF. D_DS) YOOT (10) = (DD-D_RS) + EA+600/EGHT	013410
10		1F (PD.LT.PJRS) VOOT (10) = 0.0	013520
75			
		こうか コチロタードファン 人へのずし このごと 川つえば	11.55

F

23.4		013450 - 013460 013470	
235	• GO-GRAGATE (GRATILO)/(CG-CG-CT) • (RHD)34/(PM54-RHG)) • (RHD)34/(PM54-RHG)) • (RHD)34/(PM54-RHG)) • (RHD)34/(PM54-RHG) • (GO-CG-CT) • (GO-CHG-CT) • (GO-CHG-CT) • (GO-CT) • (G	013690 013710 013720 013720 013730	
2 <b>4</b> 0	140 CONTRUE C REGION 1 IS OPEN. C REGION 4 IS CLOSED. C VIEW REGION 4 AS ONE REGION.	013750 013750 013740 013740	
545	IF(TVEN'(1).ED.10MVENT3 )YDOT(1)=YDOT(1).VCOR FORCEP3.(43-4VENT) - P1.(A1-4VENT) FOREPSRS.(A1-4VENT) IF(TVENT).ED.10MVENT3 )FORCEP3.(43-4MOLE)-P1.(A1-4MOLE)	013410 013820 013820 013840	
25.0	IF (FORC. 6F. FORR) YDOT (2) = (60/PSWT) = (FORC. FORP)  IF (FORC. LT. FORR) YDOT (2) = 0.0  YDOT (3) = VBC  TF (FORC. LT. 0.0) YDOT (2) = (60/PSWT) = FORC  YDOT (3) = VBC	013850 013870 013880 013990	
255	IF(SPS.LT.0.0.4MO.YDOT(3).LT.0.0)YDOT(3)=0.0 YDOT(4)=-RH1*YDOT(1)/Y1 - RMD13/V1 YDOT(5)=CL1*CL1*YDOT(4)/G0 YDOT(5)=CL1*CL1*YDOT(4)/G0 YDOT(5)=CL1*YDOT(4)/G0 YDOT(5)=CL1*YDOT(4)/G0 YDOT(5)=YDOT(6)-VCOR	013910 013920 013940 013940	
250	00T (9	013960 013970 013980 013990	
285	•	014010 014020 014030 014040	
270	APJ=VDOT(10)/(.098146=1.0F7)  YDOT(11)=VPJ  YOOT(12)=VDOT(7)  YDOT(13)=VDOT(7)  YDOT(13)=VDOT(8)	014060 014070 014090 014090 014100	
275	YDOT(15)=(RMD13-RMD3-RHO&)*V3/V34 YDOT(16)=YDOT(14) YDOT(17)=YDOT(15)*V4/V3 RETURN ISO CONTINUE	014110 014120 014130 014140 014150	
240	IF(MOD4.EQ.1)Gn TO 14n C REGION 1 IS CLOSED. C PEGION 4 IS CLOSED. YNOT(1) = n.0 YNOT(2) = n.0	014160 014170 014190 014190	
245	YDOT (3) =0.0	014210	

	SUGBOUTINE FDROP2	: FDR0P2	16/76	nPT=1	OPT=1 ROUND=+-6/ T94CE	/ TOACE	F.	FTN 4.9.40]	02722/85	13.15.44	5. 44
		Y001(	YDOT(4)=0.0 YDOT(5)=0.0 YDOT(4)=0.0			,			014220		
		40+EV=4EV	3.04						014250		
Ñ	200	YOUY	YDOT (9) =VPJ+44	4	1				014240		
		100x	************	0/60467	7001(7)====================================	7.001(7)===F3*(7.001(6)**1001(4))/V3* V001(8)=(BH3*C3*C3/G0)*(-(VD01(4)*V001(9))/V3	• ٤٨/		040410		
		*d) +	( \$GMd+EQ	/(PHG3*	V3411+(1.	( pwg+pwg+) ( pHg3+V34)) + (1,0 - pHg3/pHL3 +	) •		014290		
		• 09 •	Н_З-н3) в	GAM-1	0) / (CG3+C	GO+(HL3-H3)+(GAM-1-0)/(CG3+CG3+(1.9-COV+RHG3)))	H63111	•	014300		
٨	295	1F (P	Sand 39*	YOOT	Dd-8d) = (0	F(PP.GE.PUPS)YDOT(10)=(PR-PURS)*&+50/PURT	<b>-</b>		014310		
		IF (Pp	F (PP.LT.PJPS) YOUT (10) = 0.0	YOUT	0,000				014320		
		*******	APJ=4001(10)/ 4001/1)/=40/	(•09#14	APJ=YDOT(10)/(.09#146#1.0E7)				014330		
		1002	YOUT (	(1)					014340		
ñ	300	YOUX	YDOT (13)=YDOT (R)	£					014350		
•	,	Y007	141=60*	DOT (A) /	YDOT (14)=60*YDOT (A) / (CL 3*CL 3)				014370		
		YDOT	15) = (-GM	DA-RMD	YDOT (15) = (-AMD3-RMD4) *V3/V34				014380		
		YDOY	YDOT (16) = YDOT (14)	(14)	;				014390		
7	ı	YDOL (1	VDOT (17) =V001 (15) =V47 V3 OF THESE	(12)	5						
m	305	TAN CONTENSE	ų 2						07410		
		-	15 CL05						014430		
		C REGION & IS OPEN.	I S OPEN	· ·					01440		
		TOUT	1.10T(1)=0.0						014450		
Ē	310	YDOT	YDOT(2)=0.0						01440		
,		Y007	V007(3)=0.0						014470		
		YOUT	Y00T (4) =0.0						014410		
		1004	YDOT(5) #0.0								
ŕ	216	100	7) H-DH3+	VOOT (A)	**************************************	٤٨/٩			015710		
<b>n</b>	61	Y007	A) = (RH3+	0/60-60	YDOT(#)==#3=1001(8); v3 =##034; v3	£ 8/(9)			014520		
		CMG)	3/ (PHG3*	V3) ) • (1	(PMD3/(PHG3*V3))*(1.0 - RHG/PHL3				014530		
		09 •	H_3-H3)+	(GAM-1.	0) / (C63*C	GO+ (HL3-H3) + (GAM-1-0) / (CG3+CG3+(1-0-COV+RHG3)))	HG3)))	•	014540		
		+ RMD3	RMD34/PM3)						014550		
m	320	Y007	Y007 (9) = VPJ * A4	•					014560		
		IF (PR	GE PURS	YDOT(	( p = ( p = ( p	IF (PR.GE.PURS) YOUT (10) # (PR.PURS) * & * 60/PURT	_		015410		
		AG) 41	Ir(PR.LI.PJRS)Y001(IU)=0.0	) YUOT (	Ir(PR.LI.PJRS)YUOI(IU)=0.0 ADI-XDOI(10)// 00814441 051)				014190		
		100	YD011311401	7040	1134.				014500		
	325	YDOY	12) =-RH4	*YPOT (9	YDOT (12) = -RH4*YDOT (9) /V4 + RMD34/V4	134/14			014510		
•		YD07 (	13) = (BH4	143.43.	(G0*V4))	YDOT(13) = (RH4*C4*C4/(G0*V4)) + (-YDOT(9) +			014620		
		(PM) +	(PMD4/RHG4)	-0.0	* (1.0-RHG4/RHL4 +	•			014630		
		• 09 •	H_4-H4)+	(GAM-1.	0)/(06400	GO+[ML4-H4]+(GAM-1.0)/(CG4+CG4+(1.0-COV+RHG4))	1641)	•	014540		
		+ (RMD	(RMD 347 (PHG4+4M3))	*QM3))	* (PML3*P	* (PML3*PHG4/PHL4 + RMG3 +	63		014650		
m	330	4 00 +	MG3+ (H3-	44) + (GA	M-1.0) / (C	G0+DMG3+(H3+44)+(GAM-1-0)/(CG4+CG4+(1-0+COV+RHG4)))	0V*RHG	<b>*</b> ) ) )	014660		
		1001	14) #G0 **	/(8)/00 9=0#0=E	YDOT (14) #60***DOT (8) / (CL3*CL3) *DOT:15:DMI 3**DMO34 /DM3 DMO3				0.44.0		
		100>	X * 0 0 = 1 5 1	(51,100	0				014690		
		1007	17)=PMI 3	- PMD 34/	YDOT (17) "BM 3*BMD34/4M3 - BMD4				014700		
<b>.</b> -	315	hdiljd							014710		
		EMD							014720		

SIJBBUILINE FARADES	NE FOR	£ d02	74/75	0PT=1		/a-+=Qwiluh	TPACE	•	FT11 4.5	4.8.401		02/22/AS	13.15.44
-		SUPROUTINE DIMENSION COMMON/EPC	SUPROUTINE FOROP3(11.TI DIMENSION Y(N), YDOT(N) COMMON/EPCOM9/HUSED,NO	DROP3 (NN) • YOOT	1. T I ME.	FDROP3(44.TIME.Y.YDOT) (N).YDOT(N) M9/HUSED.NQUSED.MSTEP	SUPPOUTINE FDRAP3(4.TIME.Y.YOOT) DIMENSIAN Y(N),YOOT(N) COMMANYEPCH9/HUSED,MSTEP,NFE,NJE,HMI	1 es:				014730	
r			COMMON/TABIOGO, GAM, COV, ENEM, ODF SET COMMON/TABIOCAVENTAIL, VII, VPEP COMMON/TABIOCAVENTAILAI, A3, 44, A HOL COMMON/TABIOSWI, PSTRAV, MODI, WHACK COMMON/TABIOCA, C4, RMOI3, RMD34, RMD3	00+5PM PK1+PK2 OC+AVEN PSW1+PS	TOWN THE TANK THE TAN	NEW OF F VII VP MODI WH	COMMON/TABI/CO.com,COV.ENEN.OF/SET COMMON/TABZ/PKI.PKZ.AHII.VIII.VUEL COMMON/TABZ/DC.aVEVIT.AII.AII.AA.AA.AHOLE.VCOR COMMON/TABA/PSWT.PSTRAV.HODI.WRACK.HOD4 COMMON/TARS/C3.C4.RMDI3.RMD34.RWD3.RHD4.RMI.RM3.RM4.RMKIM.RMINT	MG - [ MG	3. HMA.	H41)44	INI		
10		COMMON CO	COMMON/TABG/VI,VPS\SPS\RHI,P[,V] COMMON/TABG/PSPS\PAGE COMMON/TABG/PSPS\PAGS\PL,PP,0C34 COMMON/TABG/PSPS\PAGS\PL,PP,0C34 COMMON/TABG/PSPS\PAGS\PL,PP,0C34 COMMON/TABG/PSPS\PAGS\PCQ\P\COMMON/TABG/PSPS\PAGS\PS\PAGS\PCQ\P\COMMON/TABG/PS\PAGS\PS\PAGS\PCQ\PS\PS\PS\PS\PS\PS\PS\PS\PS\PS\PS\PS\PS\	VI. VPS. PJMT. TR PSPS. PJ ELI. ES3 VRII. WG.	875.82 AVEL 195.64.6	FRPS.EKE	COMMON/TABB,/VI.VPS.SPJ.RMI.Pl.vJ.RHJ.PJ.V4.VPJ.SPJ.APJ.PH4.PA COMMON/TABR/PSPS.PJG.PL.PPR.OCJ4 COMMON/TABR/PSPS.PJG.PL.PPR.OCJ4 COMMON/TABJ/FLI.FGJ.FG4.FKPS.EKPJ.EKG4.FSUM.FINT COMMON/TABJO/RII.WG.PS.CP.CV.TE4PJ.TE4P4.HLI.HLJ.HL4.HJ3.H4	V4.VPJ. SUM.EIN HL1.HL3	.T .T 3.H(&.)	3. H¢	•	014410 014820 014830 014840	
15			COMMON/TABIZ/HVENT*NVENT*NVHIN*AVHX/IO) COWWON/TABIZ/HVENT*NVENT*AVHIN*AVHXX/IO) COWWON/TABIZ/FI COMMON/TABIZ/FI COWMON/TABIZ/FI COMMON/TABIZ/FI COMMON/TABIZ/	/ CKIP. / WENT. / PI / JOR. AD / CLI. CL	NVENT	. AVM 1 K.	COMMONYTABII/LEKIP-LPAGE-TWS.PMAX(10) COWWONYTABII/WENT.NVENT.AVM\N.AVMAX.AK.ACS COWWONYTABII/JY/I COMMONYTABIA/DR.ADR.RDP COMMONYTABII/JI/CL3-CGG3.CL4.CG4.RMG3.PML3.PMG4.PWLA	ACS L3.PMG4	4 J M G + 4			014870 014870 014880 014990	
0 2			COMMON/TABIZ/VG3,VFN,23,VFN,4,FPC3,FPS, COMMON/TABIZ/VG3,VG4,VL4,FPC3,FPS, COMMON/TABIZ/SIGMA,UI3,WE COMMON/TABIZ/SIGMA,UI3,WE COMMON/TABIZ/KWPITE,KOUTD,SREC,TITLE(	/V63.VL /NINC.P /SIGHA.	3. VG4 008 (1(	* VL 4 + EP   0) + PML3   E	COMMON/TABLIT/VG3-VL3-VG4-VL4-FPC-S-FPS4 COMMON/TAPLIT/VG3-VL3-VG4-VL4-FPC-S-FPS4 COMMON/TAPLR/NINC-PODR(10)-PML3(10)-PMD3(10)-PML4(10)-PMD4(1n) COMMON/TABL9/SIGMA-U13-WE COMMON/TABLNT/KWPITE-KOUTD-SPEC-TITLE(R)-TVENT(9)-TDROP(R)-TDIS(A)014950	(10).P.	1.4 (10) (9).TDF	. PM04()	10) FDIS (A	014920 014930 014930 014950	
۶۶	<b>.</b> .	VOLUME OF LIQUID CHAMMER. VI=Y(1) PISTON VELOCITY. VPS=Y(2)	F LIGUIU 1) ELOCITY. (2)	0 •								014960 014970 014980 014990	
30	ט ט ט	IF (MODI.EG.0) PISTON TRAVEL SPS=Y(3) LIGUIO PRESSURE.	IF (MODI.EQ. 0) VPS=0. TON TRAVEL SPS=Y(3) UID DENSITY. UID PQESSUPE.	VPS=0.	•							015000 015010 015020 015030 015040	•
35	<b>&gt;</b> 0	PI=Y(5) IF(MODI=E0.0)PI=0.0 VOLUME OF COMBUSTION CHAMBER. VJ=Y(5) DENSITY IN COMBUSTION CHAMBED	PI=Y(5) IF(MODI,EQ.0)PI=0.0 UMF OF COMBUSTION C: V3=Y(5) SITY IN COMBUSTION	101=0.0 STION C	HAMBER	• a.						015040 015040 015080 015100	
c.		PRESSURE IN COMBUSTION CHAMBER. P3=Y(8) VOLUME OF TUBE. VA=Y(9)	IN COME IN COME TUBE	AUSTION	CHAM	€₽•						015120 015130 015140 015150	
¥ ◆	<b></b>	PROJECTICE VELOCI VPJSY(10) PROJECTICE TRAVEL SPJSY(11) FORMITY IN TUBE	.E VELOCITY (10) .E TRAVEL (11) (N TUBE	• • • •								015170 015170 015190 015200	
٥٠	ט ט ט	DMASTICS  AVEDAGE POESSURE IN THE THRE  PA=V(13)  LIGHID DENSITY IN PEGION 3.  PH(13=V(14)  LIGHID MASS IN REGION 3.	16) 90ESSURF 13) FNSITY 1 (14)	F IN TH IN PFGI PEGION	IE TURE ON 3. 3.							015230 015230 015240 015250	
ቶ የ	U U	PML3=Y(15) LIGHIN NEWSITY OHL4=Y(14)		NO 1538 11	٠ 4							015270 015290 015290	

REPARATION OF THE CONTROL OF THE PARAMETER OF THE PARAMET

Š

PAGE

SUBBOUTINE FORND3	يا س	JANP3 76/76 NPT=1 HOUMN=+=0/ T9ACE	FTN 4.9.401	97/22/95	13.15.44	PAGE
	U	•• NUI9:		015300		
ç	υυ	PARTIONED LIGUID MASS IN REGION 3. PARTIONED LIGUID MASS IN REGION 4. DO 2 1=1.10 IP=1.17		015320 015330 015340 915350		
45				015370 015340 015340		
7.0	ပ ပ			01540 015410 015420 015420 015440		
ħ.	υυ	FIND THE PROJECTILE RESISTANCE PRESSUBE.  CALL POOLDES(2) * SDJ.* DJPS)  FIND THE VENT AREA.  IF (TVENT(1) * EO. 10HVENTZ ) CALL VENTI(2)  IF (TVENT(1) * EO. 10HVENTZ ) CALL VENTI(2)		015440 015440 015440 015440 01540		
O er	ט ט ט	55 IN REGION 1. AUID VOLUME OF REGION 3. HL3 S VOLUME IN REGION 3.		015510 015520 015530 015540 015540		
et E	υυυ	VG3=V3-VL3 EPS3 IS THE POROSITY IN REGION 3. EPS3=VG3/V3 RHG3 IS THE GAS DENSITY IN REGION 3. PHG3=[RH3-(1.0-EPS3)*RHL3)/EPS3 RMG3 IS THE GAS MASS IN REGION 3.		015550 015550 015550 015550		
e e	ပပ			015540 015540 015550 015570 015570		
66.	<b>U U U</b>	EPSA IS THE POROSITY OF REGION 4. EPSA*EPS3 IF (VA.GT.).0E-4)EPSA=VGA/VA RHGA IS THE GAS DENSITY OF REGION 4. PHGA=IRHA-(1.0.EPSA)*PHLA)/FPSA RHGA IS THE GAS MASS IN REGION 4.		015700 015710 015720 015730 015740		
\$0.	<b>U</b> U U	RM4 IS THE MASS IN REGION 4.  RM4=DMG4-RML4  PMSUM BIMI-TALL MASS  RMSIM=BMI-PM3-RM4  PPESSUPE AT RASE OF PRIJECTILE.  PRA-PUPS-BM4/(1.0+PUAT))	(1)	015750 015770 015780 015790 015800		
<b>c</b>	ပ ပ	IF (BB_LT.PLMS)PRTBD PDFSQLDE AT LEFT OF TUBE. PLEDBELLOAMEXIZ.OMPDWT]) - DJDGMBWA/(2.OMPDWFT) IF (FD_LT.PJBG)PL=24 INTERNAL FWEDGY DFR GRAM FOR GAS IN DFGING 3.		015430 015430 015450		

CONTROL CONTRO

115	ENER3=03+(1.0-COV*RHG3)/(RHG3*(GAM-1.0))	015970	
U	AVEDAGE INTERNAL FUERGY DES DAE TOD GAS IN DEGION 4.	015990	
		015890	
	1 TT	0.05010	
124		016610	
	LT TANCO CE	0.02.0	
, U	693	070510	
•	CG3=SGPT(G0+GAM*P3/((1.0-COV+RHG3)+RHG3))	015950	
U	990	015950	
125	CGAHSOPT(60*GAM*P4/(1.0-COV*RHG4)*BHG4)	015970	
U	บ		
		015990	
U	C C	016000	
	CL3=50RT (60* (RK1+RK2*P3) /9HL3)	016010	
130 E	3	016020	
	CL4=SORT(G0+(RK1+RK2+P4)/RHL4)	016030	
U	ຕ	016040	
		016050	
	+ (1.0=EPS3)/(RHL3=CL3=CL3))))	016060	
135 C	CA IS THE MIXTURE SPEED OF SOUND IN REGION 4.	010410	
	Temple 20   Female 20   Fema	060710	
		050010	
U	N N	01910	
040	TECH D. 1 T. 3. G. AND. MRACK. FG. 1. SELINE ACENTERACET (12. CEDM 34. COED) DIGITAL	011010	
2	TECT DATE OF DATE AND	016130	
	TF(PLP.GE.0.0) AMDIJ=DC-AVENT-SGPT(2.0*RHI+GO+nLP)	016140	•
	IF(MOD1 »E0 . 0) AMD13#0 . 0	016150	
v	LIO	01510	
145		015170	
U		01910	
•	BERRIGGE JOSE JOSE GAR	061910	
,		0102010	
6.0	TETNIC TITLE TO COMPARE TO TAKE TO TAK	012010	
•		016210	
	THE CADDA AND DESCRIPTION OF THE CADDA AND AND AND AND AND AND AND AND AND	016240	
U	ELI		
	;	016250	
155 C	EL3	016270	
,		015240	
U	EGS IS THE TOTAL INTERNAL GAS ENERGY IN REGION 3.	016290	
	CONTROL OF THE CONTRO		
9	FLA IS THE LIGGIO ENEMOS IN REGION 4.	016310	
	FOA IN THE TOTAL INTERHAL GAS ENEDGY IN DEGION A	016330	
•	GARTYNA ARGA		
U	EKPS IS THE KINETIC ENENGY OF THE PISTON.	016350	
	EKPS#0.5+PANT+VPS+VPS/GO	016340	
145 C	Ĭ.	016379	
•	COMMUNICATION OF THE CONTRACT	016340	
<b>,</b> (	CASE IN THE TAIL COURTS OF THE SAY IN FIGURE 4.	004410	
ی ر	ACCURATIONAL VALUE OF THE STREET STREET	014410	
170			

ě

PAGE

general Electrosical Esterosicas December Accelerosis, Incentivada, Incentivada Esterosica, Independental Accelerosis.

SUAPOIL	SUBPOULTIVE FRANCS 76/76 OPT=1 MOUND=+-#/ TRACE FTY 4.84-401	02/22/45 13.	:
	[F(WO)4,En,0]Gn 1(1.32	01940	
	0.00	0444	
4			
	7 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	0.000	
	C EKLA IS THE KINETIC EVERGY OF THE LIGHTO IN PEGION 4.	016490	
		016500	
		016310	
180	CONTINUE	016520	
	C ESUM IS THE SUM OF THE ENERGIES.	016530	
		016540	
	C TEMP3 15 THE GAS TEMPEMATURE IN REGION 3.	016550	
	TEMP3=01-00-COV+PHG3)/(AHG3+(GAM-1-0)+CV)	016540	
185	C TEMP& IS THE AVERAGE GAS TEMPERATURE IN REGION 4.	016570	
		016580	
	C HLI IS THE ENTHALPY OF THE LIGHTN IN REGION 1.	016590	
	HLI=ENER + PI/RHI	01660	
!	C HL3 IS THE ENTHALPY OF THE LIGHTO IN REGION 3.	016410	
190	FLURENER + PUNCHER STATE	016520	
	C MLA IS THE ENTHALPY OF THE LIGUID IN REGION 4.	016630	
	HIGHER + PA/RMIA	04410	
	C THE FRITZE FOR THE GAS IN AEGINE S.	04010	
•	MARCHAELE 4 + PAGCOV	000000	
561	C HA IS THE BATTALOY OF THE GAS IN METION 4.	0.0010	
	ACCUPACT + STREET	00.000	
		00000	
	UNCELLE TURN OUT AND CAMBON FLOOR READON A TO DECIME	00/010	
	MUNICIPAL THE GEO CENNOL TECH THOS MEGLON	01/910	
642	Tripping of Chance of House to the Property 1.	97.4410	
	TOTAL THE CONTRACT OF STREET OF STREET OF STREET	016740	
		0.4750	
	000 404 404 400 400 400 400 400 400 400	016760	
20.5	######################################	016770	
3	SINITE WOLLD'S WOL'S	016790	
		016790	
	DD3#2.0+AD#+(P3+40R)	016800	
	C RMD4 IS THE RATE OF CHANGE OF LIQUID TO GAS IN PEGION 4.	016410	
210	0.044040	016820	
	00 110 1#1-10	010010	
	PMO4 (1) MPM(4 (1) 4 (4) 4 (6.0 / PDO8 (1) ) 4 ADG (P4 + BDR)	046910	
	(I) +CEL++CELENEZE	0010	
	THE CONTINUE NATE OF CURNOR OF THE DESMETED IN DECISION	016150	
	DA++ADB)	016.90	
	TF (MOD) - FO. 0) 60 TO 150	016910	
	IF (M) 04-E9-0) 57 TO 140	016900	
	REGION 1 IS OPEN.	016910	
520	C REGION & 15 OPEN.	016920	
	1)=-VPS*41	016930	
	ŕ	016940	
	FORCEP3+(A3-AVFIT) - PI+(A1-AVFIT)	016950	
•			
325			
	Tr (TWEST) (The TOTAL NATIONAL STATEMENT)  *** TOTAL OF TOTAL STATEMENT STAT	014011	
	1	01700	

PAGE

SU-MOULTINE FORUS	FORUM 14/15 OFTH 1911-1911-1911 TARIN TARING 1911-1911-1911-1911-1911-1911-1911-191	S#/62/20	13.15.44
	IF (F00C_LT.0.0) VDOT (2) = (60/PS 41) +F04C	017910	
230	1001 (3) EVPS	017020	
	IF ( <l t-0.0.4m0.yd01(2).lt-0.01y001(2)="0.0&lt;/p"></l>	01770	
	IF(SPS.LT.0.0.A/'0.Y00T(3).LT.0.A)Y0AT(3)=0.0	01740	
	YPOT(4)==H[eYDOT(1)/V] - RMD13/V1	n17n50	
	YDOT (5) #CL1 #CL1 #Y^OT (4) /Gn	017160	
235		017070	
		017040	
	YDUT(7)==BH3+YDOT(6)/V3 + RMD]3/V1 -4HD34/V3	011090	
		01110	
	+ RM013/(RM13+V3) + (RM03/(RM63+V3)) +	017110	
240	+ (1.0 - RMG3/RHL3 + GO+(HL3-H3) + (GAM-1.0)/	011120	
	+ (CG3+CG3+(1-n-COV+RHG3))) - 9MD34/RM3)	017130	
	YD01 (9) = VP.) = VP.	017140	
	IF (PR.GE.PJRS) YOOT (10) = (PR-PJRS) + A++0/PJWT	017150	
	IF (PP.LT.PJPS) YOUT (10) =0.0	011160	
r	APJ=Y001(10)/(.098145#1.0F7)	017170	
	V001(11)=VPJ	01710	
	YDOT(12)=-AH4eYDOT(4)/V4 + RMD34/V4	01110	
	VC∩T(13)#(MH4eC4eC4/(C0ev4)) + (-YDOT(4) +	017290	
	+ (RPD4/DHG4) + (1.0-RHG4/GHL4 +	017210	
250	+ G0+(ML4-M4)+(GA*+-1.0)/(CG4+CG4+(1.0-r)/+F4G4))) +	017220	
1	+ (DECHAP + DECHAPA) + (DECHAPACA/DELA + DECH	017230	
	- 00-80 MS ( MILL ) & ( MAIL ) . ( MS + 0.0 + 0.0 - 0.0 + 0.	017240	
	VD07 (14) = 60 = VD0T (8) / (CL3 = CL3)	017250	
	YOUNG TO BE THE WALL STORY OF WALL AND THE W	017260	
248		017270	
	VOIS - MESS - ME	017280	
	VOCATION DE LA COMPANION DE LA	017290	•
	THE CONTRACT OF THE PROPERTY O	2027.0	
	00 144 144 144 144 144 144 144 144 144 1	017710	
24.0		017120	
		017330	
	+ CIPROPA - REQUIRED - CIPROPA - CIPROPA - CIPROPA	017360	
		017350	
		017350	
245		017370	
		017390	
	TOTAL STREET STREET, TOTAL STREET, STR	017300	
	+ PH_4(1) +00+/01FC	017400	
	2.00 E	017410	
27.1		017420	
	I)0T=I+2T	017430	
	YDAT(IDDI)#PM[3(I)*HAD34/RM3 - PMD4(I) +	017440	
	•	017450	
į		24110	
275	+ (D ) + AUM - FINAL OF ALCOHOLOGY (ACT )	017470	
		017490	
	<u>L</u>	017500	
U	REGION 1 IS	017510	
240	C PEGION 4 IS CLOSFO.	017520	
J	VIEW PERION 3 AND RESION & AS ONE BEGION.	017530	
		0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
	10 10 10 10 10 10 10 10 10 10 10 10 10 1	017540	
		017670	
Ę		: :	

7

5.50

295

300

305

0113000 0113000 0113000 0113000 0113000 01131110 01131110 019010 YDTY(100T)= (-PMD3(I) - PMD4(I) + + (PML3(IM)+PML4(IM)-PML3(I)-PML4(I))+ND3/DIMC)+V3/V34 YOOT(12)=YDOT(7)
YOOT(12)=YDOT(8)
YOOT(12)=YDOT(8)
YOOT(15)=(RPO]3-RHO3-RHO4)=V3/V34
YOOT(15)=(RPO]3-RHO3-RHO4)=V3/V34
YOOT(17)=YDOT(16)
YOOT(17)=YDOT(16)
YOOT(17)=YDOT(15)=V4/V3
YOOT(17)=YDOT(15)=V4/V3
YOOT(17)=YDOT(15)=V4/V3
YOOT(17)=YDOT(17)=V4/V3
YOOT(17)=YDOT(17)=V4/V3
YOOT(17)=YDOT(17)=V4/V3
YOOT(17)=YDOT(17)=V3/V34 CONTINUE YDOT(27)= (-PMD3(10) - PMD4(10) + + (PML3(9)+PML4(9))+DD4/DINC)+V3/V34 00 158 [#18.27 [P#[+10 YDOT([P]=YDOT([])\*V4/V3 FF (MOD4.ED.1) GO TO 160 PEGION 1 IS CLOSED. REGION 4 IS CLOSED. V34=V3+V4 YDOT (9)=VPJ+A4 YDOT (2) =0.0 YDOT (3) =0.0 VD 04 (4) FO 0 V YDOT(1)=0.0 YOUT(4)=0.0 YOUT (5) =0.0 IDOT= 1+17 150 CONTINUE 155 156 υU

YUNT (7) =-9H3+ (YNOT (+) +YNNT (9)) /V34

115

329

325

330

115

34.0

310

PAGE

SUMPOUTINE FEROPS	F140P3	76/76	ŋPT=1	OPT=1 ROUND=+-*/ TPACE	<b>⊢</b> `•	PACE	FTV 4.8.601	02/22/85 13.15.44	13.15.44	
400	• PMC	. PM_3(1)*D03/DINC D0 175 I=2.9	JH 10,			•.		018720		
\$0\$	1M=1-1 1007=1+ Y007 (10 + (PML3(		M(3(1))	**************************************	e.,	+ (1)E0md		018740 018750 018750 018770		
	175 CONTINUE YDOT (27) = .	CONTINUE YDOT(27) =-PWL3(10) *RMD34/RM3 - PHD3(10) YPML3(9) *DD3/NTNC	3(10) •!	RMD34/RM3		H03(10) +		018700		
٠1٠	YDOT (24 • PML 4 (1) DO 179 IM=1-1	YOOT(24)=PHLJ(1)*RMUJ4/RMJ-PHU4(1)- * PPL4(1)*DD4/DINC DO 17# [=2,9 IME[-]	JOINC PINC	D34/RM3-6		<u>.</u>		018920 018830 018840		
415	1001=1-27 YD07 (1907 + (PM_4 (1M	INOT=1+27 $PML3(I)$ = QMD34/RM3 - $PMD4(I)$ $PMD4(I)$ $PMD4(I)$ $PMD4(I)$ $PMD4/DMD1$ $PMD4/DMD1$ $PMD4/DMD1$ $PMD4/DMD1$ $PMD4/DMD1$ $PMD4/DMD1$ $PMD4/DMD1$ $PMD4/DMD1$ $PMD4/DMD1$	13(1)*1	4004/84;	i nu	+ (I) +0M0		018850 018450 018470		
<b>6</b> 20	YDOT (3)	YDAT(37)=PML3(10)*QMD34/RM3 ~ PMD4(10) • PML4(9)*DD4/PINC RETIGN	3 (10) •9 /DINC	MD34/RM3	č †	104(10) +		018900 018900 018910		

\$

PAGE

		7	76/75 OP	T=1 MOIND	OPT=1 MOUND=+-#/ THACE		FTN 4.84401	8+401	02/22/85	13.15.44
00000000000000000000000000000000000000	SURPOU THIS IS THE EPISODE. THE SYSTEMS OF BY/DI = GIVEN THE THIS COPE AND IS A 44 AND IS	THE TOPE TOPE TOPE TOPE TOPE TOPE TOPE TOP	SUBPOUTINE DRIVE  IS THE JUNE 24.  OOC. EXPERTMENT  Y/OT = F(Y*T).  W THE INTIAL VA  COPE IS FOR THE  IS A WODIFICATIO  A.C.HINDWAPSH.  G. D. RYRNE AND  NIVERICAL SOL!  UCPL-75652. LA  LIVEPHORE: CA	SURPOUTINE DRIVE (N.TO.HO.YO.TDUT. THIS IS THE JUNE 24. 1975 VERSION OF EPISODE. EXPERIMENTAL PACKAGE FOR I SYSTEMS OF ORDINARY DIFFERENTIAL EQUIA DY/DT = F(Y-T). Y = (Y(1),Y(2) GIVEN THE INITIAL VALUE OF Y. THIS COPE IS FOR THE IBM 370/195 AT A AND IS A WODIFICATION OF EAPLIER VERS AND A.C.HINDWAPSH.  1. G. D. RYRNE AND A. C. HINDWARSH. NIMERICAL SOLUTION OF ORDINARY UCRL-75652. LAWRENCE LIVERMORE LIVEDWORE, CA 94550. APRIL 1974 ON MATHEMATICAL SOFTWARE. I (1974)	SURPOUTINE DRIVE(N.TO.HO.YO.TOUT.EPS.IFGRUD.MF.INDFY)  THIS IS THE JUNE 24. 1975 VERSION OF  EDISODE. ERREPIMENTAL PACKAGE FOR INTEGPATION OF  SYSTEMS OF OPDIVARY DIFFERENTIAL EQUATIONS.  DY/DT = FYYTI. Y = (Y(1), Y(2)Y(N)) THANSPOSF.  GIVEN THE INITIAL VALUE OF Y.  AND IS A WODIFICATION OF EAPLIER VERSIONS RY G.D.AYRNE.  AND A.C.HINDWAPSH.  REFFERCES  1. G. D. RYRNE AND A.C. HINDWARSH, A POLYALGORITHW FOR THE NIMERICAL SALUTION OF ORDINARY DIFFERENTIAL EQUATIONS.  UCRL-75652. LAWBENCE LIVERMORE LARGRATORY. P. O. BOX FOR.  LIVEDWORE, CA 94550, APRIL 1974. ALSC IN ACM TRANSACTIONS.  ON MATHEMATICAL SOFTWARE. I (1975). PP. 71-96.	ATTON OF THANGE	FOSE.  SPOSE.	OPATORY OPATORY THE ONS.	018940 018940 018940 019900 019950 019960 019960 019100	
	* * *	C. H OIFFE	INDMARSH GE FOR TH RENTIAL E INDMARSH M SOLVER	AND G. D. F. INTEGRA COUATIONS. GEAR. 0	A. C. HINDMARCH AND G. D. RYGNE, EDISONE AN EXPERIMENTAL PACKAGE FOR THE INTEGRATION OF SYSTEMS OF OROINARY DIFFERENTIAL EQUATIONS, UCIO-30112, L.L.L MAY, 1975.  A. C. HINDMARSH, GEAR., OPDINARY DIFFERENTIAL EQUATION SYSTEM SOLVER, UCID-30001. REV. 3, L.L.L., DECEMBER, 1974.	ODE. AN ENS OF ON L.L.L	EXPERI 20 INAPY MAY. 1 EQUATI	MENTAL 1975. 10H 18. 1974.	019120 019130 019140 019150 019150 019170	
•	PIVE PRIVE T THE	IS A IS TO N HAK	DRIVE IS A DRIVER SU DRIVE IS TO BE CALLE IT THEN WAKES REPEAT	IRROUTINE DONCE FO	DRIVE IS A DRIVER SURROUTINE FOR THE EPISODE PACKAGE DRIVE IS TO BE CALLED ONCE FOR EACH OUTPUT VALUE OF IT THEN MAKES REPEATED CALLS TO THE COPE INTEGRATOR SURROUTINE. TSTEP.	DE PACKI VALUE (	A6E. DF T.	j 1 1 1 1 1 1 1	01920 01920 01923 01923 01923	
-	H	E	THE INPUT PARAMETERS ARE  N	AMETERS ARE AS FOLLOWS.  IR NUMBER OF DIFFERENTIAL FIRST CALL. UNLESS INDEX INCREASED DUNN 'G A GIVEN IN INTIAL VALUE OF T. THI (USED FOR INPUT ONLY ON F IE STEP SIZE IN T (USED F FIRST CALL, UNLESS INDEX FIRST CALL, UNLESS INDEX THE STEP SIZE TO BE USED.		EQUATIONS (195D ONLY = -1). N MUST NEVER PROBLEM. INUEPENDENT VARIABLE IPST CALL). IR INPUT ONLY ON THE IN INPUT). WHEN MIJM ARSOLUTE VALUE OR	US (11SED ONLY N MUST NEVER WDENT VARTABLE L). LONLY ON THE ONLY ON THE ONLY ON THE	2 H	019250 019240 019240 019300 019310 019310 019310	
	TOUT EPS		A VECTOR OF Y (USED F Y (USED F THE RELA L. UNLESS IN UNLESS	VECTOR OF LENGTH N CON Y (USED FOR INPUT ONLY INTERPATION WILL NORM INTERPATION WILL NORM INTERPATION WILL NORM INTERPATION WILL NORM INTERPATION WILL NORM INTERPATION WILL NORM INTERPATION WILL ES INTERPATION ONLY HEASURED PER STEP (OF HEASURED PER STEP (OF THEN PES IS A BOUND OF THE VECTOR R. 1.5.	A VECTOR OF LENGTH N CONTAINING THE INITIAL VALUES OF Y (USED FOR INDIT ONLY ON FIRST CALL).  Y (USED FOR INDIT ONLY ON FIRST CALL).  INTEREATION WILL NORMALLY 60 REYOND TOUT AND INTERPT ATE TO T = TOUT. (USED ONLY FOR INPIT.)  INTERPT ATE TO T = TOUT. (USED ONLY FOR INPIT.)  INTERPT. VE ERROP BOUND (USED ONLY FOR INPIT.)  UNLESS INDEX = -1). THIS BROUND IS USED AS FOLLOWS. LET R(1) DENOTE THE ESTIMATED RELATIVE LOCAL EPROR IN Y(1). I.E. THE ESTIMATED RELATIVE LOCAL EPROR IN Y(1). I.E. THE FROM RELATIVE TO YMAX(1). AS HEASURED PER STEP (OF SITE H) OR PER SS UNITS OF T. THE!! FS IS BOIND ON THE ROOT-MEAN-SQUARF NORM OF THE VECTOR P. I.F.	3 THE IN 351 CALL 15 DESI 16 DESI 17 DESI 17 DESI 17 PE TO 17 PE TO	TITIAL V RED NEX TOUT AN FOR IN FIRST FIRST FIRST FIRST SE D OS VE L O	ALUES OF 10 10 10 10 10 10 10 10 10 10 10 10 10	019350 019370 019370 019370 019400 019410 019450 019440	

019470 019490 019490

Š

EDDOR CONTROL PER SS UNITS OF T IS DESTORD. SFT THE VECTOR YMAX IS COMPUTED IN DRIVE AS DESCRIPED

INDER TEARDR RELOW IF EARDR CONTROL P

SORT ( SUM ( R(I)\*\*2 ),/N ) .LT. EPS.

ŝ

105

Ë

35

ç

20

2

•	
_	
1	
-	
_	
TOACE	
ند	
ن	
-	
=	
œ	
_	
`	
•	
•	
•	
٠	
••	
0	
~	
=	
_	
_	
~	
•	
-	
"	
_	
a	
/*=UNDON 1=1=0	
u	
£	
Ξ	
76/76	
`	
ø	
~	
-	

02/22/45 13.15.44

•		AT IT ROBBER OF THE WARRENCE OF THE ROBBER OF THE ROBBER OF THE PROBBER OF THE PR	0.3010
ں ر		SET TO ZERO) AND UPDATE IT AFTER STATEMENT 50.	019540
U			95.5
U	TEBP08 =	# H	019540
U		AMSOLIITE ERHOR IS CONTPOLLED. YMAX(I) =	σ
U	•	ABS(Y) IS CONTROLLED.	
U		A DIVIDE ERHOR WILL OCCUP. YMAX(I) = AHS(Y(I)).	019590
U	•••	3 ERROR PELATIVE TO THE LADGEST VALUE OF ARCIV(1) SEEN	6
0		SO FAR IS CONTROLLED. IF THE INITIAL VALUE OF Y(1) I	
<b>U</b> (		O.O. THEN THAX(I) IS SET TO 1.0 INITIALLY AND DEPAINS	019620
<b>U</b> (	,	THE STATE OF THE S	019630
• د		TOTAL	
• د		INDEX # 417.0 ALLUMID VALUES AME 10. 11.0 LC. 15.0	054610
ا و		THE LOS OF THE PROPERTY AND THE PROPERTY	000000
ى ر		THE PRODUCT THE PRODUCT OF THE CONTRACT OF THE	0 10 10
ه د		CBN 35 -1300031 OF BU LAM INDIVIDED TALK (BILLIANS)	001010
ى ر		METER 1 INDICATES VARIABLES CATED CATED CATED SERVICES	01010
ى د		OPDER ADAMS METHOD. SUIT	019710
<u>ں</u> ر		,	019720
· U		METH # 2 INDICATES VARIABLE-STEP SIZE. VARIABLE-	019730
U		OPDER BACKWARD DIFFERENTIATION METHOD.	019740
U			019750
U		MITER INDICATES THE METHOD OF ITERATIVE CORRECTION	019760
U		(NONLINEAR SYSTEM SOLUTION).	019770
v		MITED # 0 INDICATES FUNCTIONAL ITERATION (NO	019790
· U			019790
		MITTO H I INDICATES A CHORD OF SEMI-STATIONARY	019800
		,	019810
			019820
. U		USER SUPPLIED SUBROUTINE	019830
· U		PEDERVIN,T,Y,PO,NO) DESCRIBED BELOW.	019840
· U		MITER # 2 INDICATES A CHORD OR SEMI-STATIONAPY	019850
U			019860
U		COMPUTED FINITE DIFFERENCE APPROXIMATION	019970
υ			019880
U		MITER # 3 INDICATES A CHORD OR SEMI-STATIONARY	019890
U		NEXTON METERS ATTE BY INTERNALLY	006610
<b>U</b> (		COMPUTED DIAGONAL MATRIX APPROXIMATION	016610
U (		NEGATIONAL BASED ON A DIMECTIONAL	02510
ى د	* ***	- Thirties incen	0.0000
) U		PER THE PER PER PER PER PER PER PER PER PER PE	019950
U		I THIS IS THE FIRST CALL FOR THIS PROALEM.	019960
Ų	-	O THIS IS NOT THE FIRST CALL FOR THIS PROBLEM.	019970
U		AND INTEGRATION IS TO CONTINUE.	019980
U	7	-1 THIS IS NOT THE FIRST CALL FOR THE PROGLEM,	066610
U		AND THE USER HAS RESET'N, EPS, AND/C	050000
U	~		050010
U		I ON A	020020
Ų (	•	ASSUMES	05000
U (	r,	3 SAME AS 0 EXCEPT CONTROL PETURNS TO CALLING	020040
، د		MODERN CONTROLL VAL	04000
, <b>c</b>		TI NEED NOT BE DESET FOR NORMAL CONTINIATION.	020070
· U			050080
U	AFTER THE	AFTER THE INITIAL CALL. IF A 100MAL RETURM OCCUPPED AND A UPPMAL	050020

FTN 4.8.501	
/ TPACE	
R0140=+-+	
JPT=1	
74/76	

02/22/PS 13.15.44

TO STATE OF THE ST

THE OUTPUIT PARBMETERS AME AS FOLLOWS.  TO TOHIT VALUE OF T. IF INTEGRATION WAS SUCCESSFULLY TO A TOHIT OF THE NEW TO THE NEW THE NEW TO THE THE TOTAL THE NEW TO THE STEP THE NEW TO THE NEW TO THE STEP THE NEW TO THE STEP THE NEW TO THE STEP THE NEW TO		OF PAPAWETERS WITH THOEX * -1 CAN ME MADE AFTER SUCCESSFUL DETHIN.
THE OUTPULT  TO # TO!!  # THE COMPUTE  THE CAMPUTE  INTEGRATI  INT		AHE
DEX = THE CAPED SIGNED BY SECHED BY SE		OUTPUT VALUE OF T. IF
DET THE COMBUTE  THE COMBUTE  THE COMBUTE  THE COMBUTE  THE THE THE  THE		TO # TOUT. OTHERWISE, TO IS THE LAST VALUE OF T
DEST THE CONTROL  INTEGRATION TO BY A TEST  INTEGRATION TO BY VO.  INTEGRATION TO		ACT - MASTHED SHOOFSELLIN ON MAT
DEX = INTEGED USE  INTEGED		
DOITION TO DRIVER A  THE THE GRAPINTEGRANI  1.610 FRC	DE X	INTEGEP USED ON OUTPUT TO INDICATE RESULTS.
1 INTEGRALI 1 ETAPS INTEGRALI 1 E ELO FRO 1 E ELO FRO 1 E ELO FRO 1 HE INTEGRALE 2 CORRECTO OF FACTOR OF FACTOR OF THE STAND OF FACTOR OF F	1	WITH THE FOLLOWING VALUES AND MEANINGS.
THE INTEGERS TEE  1-EPROR TEE	•	INTEGRATION WAS COMPLETED TO TOUT OR GEYOND.
AFFER PROPRIES  AFFER PROPRIES  AFFER PROPRIES  BY A TEST  CORRECTOR  CORRECTOR  CORRECTOR  BY A TEST  BY A TEST  CORRECTOR  BY A TEST  CORRECTOR  BY A TEST  CONTROL	7	THE INTEGRATION WAS HALTED AFTER FAILING TO PASS THE
1.610 FRC -2 AFTER SOFTER SOFT		EARDA TEST EVEN AFTER REDUCING H RY A FACTOR OF
AFTER SOLUTION TO DRIVE,  A IMMEDIATE SOLUTION TO DRIVE,  INDEX WAS NOT BRANGTER WAS NOT BRANGTER AND BRIVE, CONTROLL CO		1.E10 FROM ITS INITIAL VALUE.
HALTED E HALTED E HALTED E HALTED E HALTED E HALTED E HALTED A HE LATED A HE LATED A HE LATED A HALTED A HALTER	۶-	AFTER SOME INITIAL SUCCESS. THE INTEGRATION WAS
99 A TESI 96 EN A TESI 96 EN A TESI 100 EN A TES		HALTED EITHER BY REPEATED ERROR TEST FAILURES OP
DOITION TO DRIVE,  TERPLY NO.		BY A TEST ON EPS. POSSIRLY TOO MICH ACCIIRACY HAS
THE INTEGREGATE		GEEN REGUESTED, OR A BAD CHOICE OF MF WAS MADE.
CORRECTOR  -4 IMMEDIA  PARAMETER WAS WAS  BARAMETER  ONER  CONTROL	E.	THE INTEGRATION WAS HALTED AFTER FAILING TO ACHIEVE
FACTOR OF		PEDIICING H RY
THMEDIATE  PRABMETER  PRABMETER  WAS NOT B  WAS NOT B  PERFORMED  SIMPLY AS  INDEX WAS  NO ACTION  TERP(YNO) IS THE  OVER A  CIN-NO-A-E-IP-IEG)  CIN-NO-A-E-IP)  OR HITER = 2-  ISED MUST FURNISH  FEITH (1-1-Y-YODT)		FACTOR OF 1-E10 FROM ITS INITIAL VALUE.
PARAMETER  BARAMETER  BARAMETER  WAS NOTE  WAS NOTE  BERFORMED  SIMPLY CA  NO ACTION  TEP (YNO) IS THE  CONTREL  CINNO AND TER  CINNO AND TER  CINNO AND TER  DEET OF TER  CINNO AND TER  DEET OF TER  CINNO AND TER  DEET OF TER  OF MITER = 2.  ISED MUST FURNISH  FELLH (11 TY YNOT)	1	IMMEDIATE HALT BECAUSE OF ILLEGAL VALUES OF INPUT
PARAMETER WAS METER WAS MATER WAS		PARAMETERS. SEE PRINTED MESSAGE.
PARAMETER WAS WOT B WAS WOT B SIMPLY CO SIMPLY	y.	INDEX WAS -1 ON INPUT, BUT THE DESIRED CHANGES OF
WAS NOT BERFORMED SIMPLY WAS NOT BINDEX WAS NO ACTION DELICE IN THIS. PACKA TERP (TOUT.*Y.NO.*YO) TEP (Y.NO.*CONTROLST (Y.NO.*CONTROLST (Y.NO.*CONTROLST (Y.NO.*A.F.) SO PSET. DEC. AND OP HITER # 2.  ISED MUST FURNISH FILM!		PARAMETERS WEPE NOT IMPLEMENTED BECAUSE TOUT
PERFORMED STHPLY CA INDEX MAS NO ACTION DO DIVE, MODER A CONTROL SET SETS COEFFICIENTY, NO. CONTROL AND CONTROL SET SETS COEFFICIENTY, NO. CONTROL SET SETS COEFFICIENT, NO. CONTROL SET		WAS NOT BEYOND T. INTERPOLATION TO T = TOUT WAS
SIMPLY CA NO ACTION NO ACTION DDITION TO DRIVE, TEP (Y,NO) IS THE OVER A CONTROL JUSTY,NO, AND ADJUST ET (Y,NO, CON, MITER) C (N,NO, A, IP, IER) C (N,NO, A, IP, IER) DSET, DEC, AND OR MITER = 2, OR MITER = 2, ISEQ MUST FURNISH FELLH (1,1,1,7,7007)		PERFORMED AS ON A NORMAL RETURN. TO CONTINUE.
DOITION TO DRIVE,  DOITION TO DRIVE,  IDED IN THIS, PACKA  CONTROL  IDST (Y*NO) ADJUST  ET(Y*NO) ADJUST  ET(Y*NO) ADJUST  ET(Y*NO) ADJUST  ET(Y*NO) ADJUST  PSET DEC, AND  OR MITER = 2,  ISED WUST FURNISH  FEIH(**1,**********************************		I AND A NEW TOUT
NO ACTION NO ACTION DDITION TO DRIVE, IDED IN THIS, PACKA TERP(TOUT, Y, NO, YO) TEP(Y, NO) IS THE OVER A CONTENT L(N, NO, A, P, IE, IE, S PSET, DEC, AND OP HITER = 2, OP HITER = 2, ISED MUST FUPNISH FEITH (1, T, Y, YDOT)	ç	DEX WAS 2 ON INPUT. BUT TOUT WAS NOT BEYOND I
DDITION TO DRIVE, TERP(TOUT,*Y+NO,YO) TEP(Y*NO) IS THE OVER A CONTROL SET SETS CAFFICE T(Y*NO) ANJUST T(Y*NO) ANJUST T(Y*NO) ANJUST T(Y*NO, ANJUST T(Y*NO, ANJUST T(Y*NO, ANJUST T(Y*NO, ANJUST T(Y*NO, ANJUST T(Y*NO, ANJUST T(Y*Y*YOOT)		ACTION
DED ITOW TO DELIVE, DEED TOUT + WO WO WO TERP (TOUT + WO WO WO) TEP (Y WO) IS THE OWER A CONTROL SET SETS CREFFICE JUST (Y WO CON MITER) C (N WO A R P IP I SO PSET DEC. AND OR MITER # 2. DIST FURNISH FILLE WO ST FURNISH FILLE WO ST FURNISH FILLE WO ST FURNISH		
TEP (Y,NO) IS THE OVER A CONTROL  SET SETS COEFFICE  JUST(Y,NO,CON,MITER,CIN,NO,A,R,IP,IER)  C(N,NO,A,R,IP,IER)  PSET DEC. AND  OR MITER = 2.  FISH('1,T,Y,YDOT)	IN ADDITION	E FOLLOWING SUMMOUTINES ARE USED
TEP (Y NO) IS THE OVER A CONFOLD IS THE CONFORM IN THE CONFOLD IS	PROVIDED IN	THIS PACKAGE HT.V.M. Vol. Pathodolithe of Ath Ottobe Values at
TEP(Y,NO) IS THE OVER A CONFROLL OLIST (Y,NO) ADJUST ET (Y,NO,CON,MITER, CIN,NO,A,E,IP) SO PSET, DEC, AND OP HITER = 2.  ISED MUST FUPNISH FILM (Y,Y,YDOT)		
OVER A  CONTROL  CONT	TSTEP (Y.N	IS THE
CONTROL.  CONTROL.  JUST (**NO) ADJUSTS THE MISTORY APPRAY YON REDUCTION OF DRDE ET (**NO*A) ADJUSTS THE MISTORY APPRAY YON REDUCTION OF DRDE ET (**NO*A) EATER) COMPUTES AND PROCESSES THE JACORIAN MATRIX. J = DF/DY.  CIN*NO*A*PA:PP: SOLVES A LINEAG SYSTEM A*X ** 8. AFTER DEC HAS REEN CALLED FOR THE MATRIX A.  PSET. DEC. AND SOL ARE CALLED IF AND ONLY IF MITER = 1  OR MITER **?.  SOLVES THE FOLLOWING SUMROUTHES  FFIRM(**1*Y*YDOT) COMPUTES THE FUNCTION YOUT = F(**T).  THE RIGHT HAND SIDE OF THE OWDINARY  OIFFERMY AND YOUT ARE VETTORS OF LENGTH M.		OVER A SINGLE STEP AND DOES ASSOCIATED ERROR
SET SETS CREFFICIENTS FOR USE IN TSTEP.  JUST (Y.NO) ANJUSTS THE HISTORY ARRAY Y ON REDUCTION OF ORDE ET(Y.NO.CON.MITER.IER) MATRIX. J = DF/DY.  CIN.NO.A.IP.IER) PERFORMS THE LU DECOMPOSITION OF A WATRIX.  CIN.NO.A.E.IP.SOLVES A LINEAR SYSTEM AXX B. AFTER DEC  HAS BEEN CALLED FOR THE MATRIX A.  PSET. DEC. AND SOL ARE CALLED IF AND ONLY IF MITER = 1  OR MITER # 2.  FISHE WUST FURNISH THE FOLLOWING SUBROUTHES  FISHE COMPUTES THE FUNCTION YOUT = F(Y.T).  THE RIGHT HAND SIDE OFFITTING YSTEW. WHERE Y  OFFIT ONLY THE OPEN AND YOUT ARE YSTEW.		CONTROL.
UIST(Y*NO) ADJUSTS THE HISTORY APRAY Y ON REDUCTION OF ORDE ET(Y*NO.CON.MITER.IER) COMPUTES AND PROCESSES THE JACORIAN MATRIX. J = DF/DV.  CIN.NO.A.ID.IER) PERFORMS THE LU DECOMPOSITION OF A WATRIX.  L(N.NO.A.E.ID.) SOLVES A LINEAR SYSTEM AXX = 8. AFTER DEC  MAS REEN CALLED FOR THE MATRIX A.  PSET. DEC. AND SOL ARE CALLED IF AND ONLY IF MITER = 1  OR MITER = 2.  ISEE MUST FURNISH THE FOLLOWING SUPROUTINES  FRIB(************************************	COSET SE	CHEFFICIENTS FOR USE IN TSTEP.
ET(Y.NO.CON.MITER.EER.EX)  MATRIX. J = DF/DY.  CIN.NO.A.IO.TER)  PERFORMS THE LU DECOMPOSITION OF A WATRIX.  L(N.NO.A.E.IP) SOLVES A LINEAR SYSTEM A*X = 3. AFTER DEC  MAS REEN CALLED FOR THE MATRIX A.  PSET. DEC. AND SOL ARE CALLED IF AND ONLY IF MITER = 1  OR MITER = 2.  FEINH (4).T.Y.VDOT) COMPUTES THE FUNCTION YBOT = F(Y.T).  THE RIGHT HAND SIDE OF THE OPSINARY  OIFFREVIAL CHAITON SYSTEW. MHESF Y  AND YDOT ARE VECTORS OF LFISHEN.	ADJUST (Y.	
CIN.NO.4. IP. IER) PERFORMS THE LU DECOMPOSITION OF A WATRIX LIN.NO.4. P. IE. B. SOLVES A LINEAR SYSTEM A*X = 8. AFTER DEC MAS PSET, DEC. AND SOLVES A LINEAR SYSTEM A*X = 8. AFTER DEC OR MITER = 1. OR MITER = 2. OR MITER = 2. IF SOLVED ON THE MITER = 1. IN.NO.1. THE FOLLOWING SUPPOUTINES F(Y*I). THE FIGHT HAND SIDE OF THE OPDIMARY OIF FREY HAND SIDE OF THE OPDIMARY OF STREYS, WHERE Y	PSET(Y.NO	
LINNONA, RECORDED TO THE MATRIX A.  PSET, DEC. AND SOL ARE CALLED FOR THE MATRIX A.  PSET, DEC. AND SOL ARE CALLED IF AND ONLY IF MITER = 1  OR MITER = 2.  ISEQ MUST FURNISH THE FOLLOWING SUPROUTINES  FRIN(14,T,Y*YDOT) COMPUTES THE FUNCTION YBOT = F(Y*T).  THE RIGHT HAND SIDE OF THE OWDINARY OUTERFEVENT HAND SIDE OF THE OWDINARY AND YROT ARE VECTORS OF LEHISM.	OF CALL	ATTAIN TO MOTATOR OF THE THE PROPERTY OF A MATERIAL OF THE TAIL OF
PSET DEC AN OR MITER = 2.	NA N	COLVER A THEAD EVENTS ARE SO, AFTER DEF
PSET. DEC. AND SOL ARE CALLED IF AND ONLY IF WITER OR MITER = 2.  ISEO MUST FURNISH THE FOLLOWING SUPROUTINES  FEIN(4,1,7,7,7001) COMPUTES THE FUNCTION YBOT = F(Y,T)  THE RIGHT HAND SIDE OF THE DADINARY  OFFFERENCE FOR STAFF OF AND YDOT ARE AND YDOT AND AND YBOT A	404.42.1	
OF MITER = 2.  (ISEO MUST FURNISH THE FOLLOWING SUPROUTINES FEIN(**T*Y*VDOT) COMPUTES THE FUNCTION YBOT = F(Y*T) THE RIGHT HAND SIDE OF THE ORDINARY OFFEREVIAL EGHNATORS OF LENGTH AS		AND COL ARE CALLED TE AND ONLY TE WITED
USED MUST FURNISH THE FOLLOWING SUPPOUTINES [FEIDH (N.T.Y.YDOT) COMPUTES THE FUNCTION YDOT = F(Y.T) THE RIGHT HAND SIDE OF THE OPDIMARY OIFFEREVIAL EDINATY AND YDOT ARE VECTORS OF LENGTH N.		
USEO MUST FURNISH THE FOLLOWING SUMMOUTINES [FEIDHINGT+Y+YDOT] COMPUTES THE FUNCTION YDOT = F(Y+T) THE RIGHT HAND SIDE OF THE OMDIMARY OIFFFREUTIAL EDINTING YSTEM, WHERE AND YDOT ARE VECTORS OF LENGTH M.	5	
[FIDH (4,T,Y,YDOT) COMPUTES THE FUNCTION YDOT = F (Y,T) THE RICHT HAND SIDE OF THE OADBAARY OIFFEREVIAL COUNTION SYSTEM, WHEAR AND YDOT ARE VECTORS OF LENGTH AL	THE LISED MU	I
THE RIGHT HAND SIDE OF THE OWDINARY DIFFERENTIAL EDUALION SYSTEM, WHERE AME YESTORS OF LENGTH M.	O IFFIIN (No	COMPUTES THE FUNCTION YDOT = F (Y+T)
OIFFERENTAL EGUATION SYSTEM, WHERF Y AND YOUT ARE VECTORS OF LENGTH N.		
APD YOUT ARE VELLORS OF LFMGTT M.		OIFFFREUTIAL EDUATION SYSTEM, WHEAF Y

1,0

	76/76 OPT=1 20UND=+-0/ THACE FTW 4.8+601 0.	38/22/20
175	PAPTIAL DEWIVATIVES AND STORES IT IN PD AS AN NO 3Y NO ARDAY. POLI.JJ IS TO RE SET TO THE PARTIAL DERIVATIVE OF YOT(1) WITH RESPECT TO Y (J.). PEDEW IS CALLED IF AND OSLY IF MITER = 1. FOR OTHER VALUES OF WITTER, PEDERV CAN HE A DUMMY SURROUTINF.	02067n n20640 n20690 02070 n20710
. P. J.	CAUTION AT THE PRESENT TIME THE MAXIMUM NUMBER OF DIFFERENTIAL EQUATIONS, WHICH CAN BE SOLVED BY EPISODE, IS 20. TO CHANGE THIS NUMBER TO A NEW VALUE, SAY NMAY, CHANGE Y(20,13) TO Y(NMAX,13), YMAX(20) TO YMAX(NMAX),	020730 020740 020750 020750
145		020740 020490 020810 020910
JoU	FROM 20 TO NHAX. NO OTHER CHANGES WED TO BE MADE TO ANY OTHER SUBROUTINE IN THIS PACKAGE WHEN THE WAXIMUM NUMBER OF EQUATIONS IS CHANGED. ELSEWHERE, THE COLUMN LENGTH OF THE Y ARRAY IS NO INSTEAD OF 20. THE ROW LENGTH OF Y CAN BE REDUCED FROM IS TO A IF METH = 2.	020440 020450 020450
195	THE COMMON BLOCK EPCON9 CAN BE ACCESSED EXTERNALLY BY THE USEP.	020400 020400 020410
200	IF MF DESIGNS. IT CONTAINS THE STEP SIZE LAST USED SUCCESSFULLY (MUSED). THE ORDER LAST USED SUCCESSFULLY (MUDISED). THE ORDER SO FAREN SO FARENSON. THE NUMBER OF FUNCTION FURTHER UNBER OF FUNCTION (DIFFIN CALLS) SO FAR (NFE). AND THE NUMBER OF JACORIAN EVALUATIONS SO FAR (NJE).	020950 020950 020950 020950
505	C IN A DATA STATFMENT RELOW, LOUT IS SET TO THE LOGICAL HNIT NUMBER OF FOR THE DHIPHY OF MESSAGES DURING INTEGRATION. CURRENTLY, LOHT C = 3.	020990 020990 021000 021010
210	DIMENSION Y(50.13).Y0(50) DIMENSION YMAX(50).EHPOR(50).SAVE1(50).SAVE2(50).SAVE3(50) DIMENSION PW(2500).IPIV(50)	021030 021040 021050 021050
215	COMMON /EPCOMI/T.M.HMMN.HMMX.EPSC.SS.UPOUND.NC.MFC.KFLAG.JSTART COMMON/EPCOMB/FPSJ.NSGR COMMON/EPCOM9/HUSED.NGISED.NSTEP.NJE.NMI COMMON/TABINT/KWRITE.KOUTD.SREC.TITLE(A).TVENT(B).TDROP(B).TDIS(A)	021090 021090 021100 021110
22.0	DATA LOUT /// HCUT=.1 FOUR=6.0 HUNDRD=100.0	021130 021150 021150 021150
525	ONF=1.0  TEN=10.7  ZEPO=0.0  IF (INDEX "FO. 0) GO TO 20  IF (INDEX "EO. 2) GO TO 25  IF (INDEX "EO1) GO TO 35	021190 021200 021200 021210 0221210

SUBPOUTINE	THE DRIVE 76/75 OPT=1 ROTHD=+-+/ TRACF FTW 4.8+601	02/22/85
230	IF (INDEX "FO, 3) GO TO 40  IF (INDEX "NE, 1) GO TO 430  IF (FPS "LE, 7EPO) GO TO 400  IF ("LE, 0) GO TO 410  IF ("TO-TOUT)"HO "GE, ZFPO) GO TO 420	021240 021250 021250 021270
235	C THE SHOULD WALLES FOR YMAY OTHER THAN THOSE BELOW ARE DESIRED. C THEY SHOULD BE SET HERE. THE C VALUES FOR HIN OR HMAX, THE ROUNDS ON THE ABSOLUTE VALUE OF H. C VALUES FOR HIN OR HMAX, THE ROUNDS ON THE ABSOLUTE VALUE OF H.	021240 021300 021310 021320
540	IF ERPOR PER SS UNITS OF T IS TO TO A POSITIVE VALUE RELOW. EPROWHEN SS = 1. THE REFAULT VALUE OF ERROR PEP STEP.	021340 021350 021350 021370
245		021390 021390 021400 021420 021420
250	URCUMD=7.105427406E-15 00 10 I = 1.W GO TO (5, 6, 7), IERROR	021450 021450 021470 021470
ን የ	C YMAX(I) = ONE C ONTO 10 C YMAX(I) = AMAX1(Y0(I) • SPEC)	021500 021500 021510 021520
240	7 $VMAX(I) = MS(VO(I))$ I = VMAX(I) = VO(I) 10 $V(I+1) = VO(I)$ VC = N	021550 021550 021550 021570
245	T SUBROUTINE DRIVE IN EPISODE.	021590 02150 02151 021530
270	2618.8.1PH IN THE NEXT STEP.()  2618.8.1PH IN THE NEXT STEP.()  HMINHARSKHO)  HMAX=ARS(TO-TOUT)*TEN  EPSC = EPS	021640 021650 021650 021670 021680
275	SS = ZEDO	02170 021710 021770 021730
, , , , , , , , , , , , , , , , , , ,	NHCUIT SO GO TO SO C TOP IS THE PREVIOUS OUTPUT VALUE OF IN FOR USE IN HOAX,	021750 021750 021770 021740 021790
L .		

SUPPOUTINE	NE NOTVE 76/76 NPT=1 40UND=+-+/ T4ACE FIN 4.8+601	02/22/85	13.
	IF (IT-TOUT)** GE. ZFPO) GO TO 450	021910	
	TO MS	021420	
	30 IF ((T-TOUT) *H .GE. ZEPO)	021840	
240	E	021850	
	30 m 30 M	021860	
	, 3	02120	
	. 5	021890	
295		021900	
	CT H XVX H TO	021910	
	,	021920	
	45 IF ((T+H) .EQ. T) 4RITE(6,15) T	021930	
9	U	021940	
202	SO CALL TSTEP(NO.NSO.Y.YMAX.ERPOR.SAVE].SAVE2.SAVE3.PW.TPTV)	021960	
		021970	
	) = 1 - KFLAG	021980	
305	0123	- 055000	
1		022010	
	CONTINUE	022020	
		050250 -	
	C NORTAL RETURN FROT TSTEP.	022040	
016	C THE DETENT VARIATION OF DESCRIPTION OF THE PRESENCE AND DETENT OF THE PRESENCE OF THE PRESEN	05020	
	THE METERIOR OF CET MEDE. TO AC TO BE HODRED FOR COM	022020	
	COOLS OF STATE OF TO THE CHOIN DAILED BY CONFINENCE A THEST	022040	
	MADE TO DETERMINE IF EPS IS TOO SMALL FOR MACHINE PRECISION.	052000	
315		022100	
•	ANY OTHER TESTS OR	022110	
		022120	
		022130	
	IF INDEX = 3. YO IS SET TO THE CURRENT Y V	022140	
320	IF INDEX = 2. H IS CONTROLLED TO HIT TOUT	051220	
	ERROR), AND THEN THE CURRENT Y VALUES ARE	052150	
	RETURNS FOR ANY OTHER VALUE OF INDEXS CONTROL METURNS	04170	
	THE INTEGRATOR UNIESS TOOL HAS HERN REACHED.	01220	
90	EMPERIOR AND VALUES OF TAME COMPOSED AND STORED IN TO	02220	
363	TE INTERPOLATION IS NOT DESIRED. THE CALL	022210	
	ME DELETED AND CONTROL THANSFERRED TO STATEMENT 500	02220	
	OF 520.	052530	
•		072220	
330	N T T T T T T T T T T T T T T T T T T T	02226	
		022270	
	G TO (70 66 67) - IERROR	022290	
	1. 2. 3	062220 -	
335	S YMAX(I)=AMAXI(	0 25 30 0	
	60 10 70	022310	
		0 45 25 0	
	70 D=D+(PVIX 4   7   7   7   7   7   7   7   7   7	055 330	
940	TELL CATANDON OF TO SEA	022350	
	(140FK .FO. 3) G	022350	
	.F7. 21 GO TO	025370	

SUBROUTINE NOTVE	E np tv	<u>u</u> .	74/76	=T40	1 40r	OPT=1 40UND=+-+/	*/ TRACE		FTN 4.8460	104•	02/22/PS	13-1
345	8	1F ((T CALL 1 TO = T	-TOUT NTE PP OUT	.+ .LT. (TOUT. Y	. ZEPO) Y. NO.	003 GO 10• Y03	TO 45	•			022360 - 022360 022400	
35.0	¥i Œ	IF (ABS) IF (ABS) IF (ABS) IF (T) USTABT	((T+H)-1 ((T+H)-1 (T-TOUT) (TOUT - RT = -1	-TOUT) - H TOUT) - LE - H JT) - H - GE - - T) - (ONE	HUNDR HUNDR E ZER	ZERO 10+UPO 10) GO 10UR+U	TE (((1+H)-TOUT)** **LF. ZERO) GO TO 45  IF ((1+H)-TOUT)**LF.**HUYDRD**UPOUND***M*X) GO  IF ((1-TOUT)**H **GE. ZERO) GO TO 500  H = (TOUT - T)**(ONE - FOUR**UROUND)  JOTART = -1	5 50 TO S0	c		022470 022430 022430 022440 022450	
355	N TO	C ON AN EPROP C KFLAG = -2, C TO RECOVER, C TIMES BEFORE	ON AN EPPOP RETURN FOOM TSTEP, AN IMME RECOVERY ATTEMPTS ARE TO RECOVER, H AND HMIN ARE REDUCED BY TIMES BEFORE GIVING 11P.	URN FPO RECOVE ND HMIN	M TST	EP. A		DIATE RETUR MADE OTHERW A FACTOR OF	HN OCCURS HISE.	15 IF	- 022490 02250 02250 022510 022510	
360	101	WRITE FORMAT WRITE (	1 -/ 1/4	1 1 1 2 5	ESSAG D.E.	MESSAGE FROM	MESSAGE FROM SURROUTINE DRIVE IN FPISODE	INE DPT	VE IN EPI	Sode	022530 022540 022550 022550 022550	
345	105	FORMAT (5x WRITE (6 ) 1 FORMAT (7/2) 140H ERROR IF (NHCUT MHCUT MHCUT H MHCUT	FORMAT(5x,•J] =••IS) WRITE(4,105) T.HMIN FORMAT(//35H KFLAG = -1 FDOM INTEGE AOW ERROR FEST FAILED WITH ABS(H) IF (MHCUT .Eo. 10) GO TO ISO MHCUT = MHCUT 1		5) N N ELED 60 T	. FPOM WITH '0 150		<b>4</b> 2	" T = "E19.R/ ="E18.8/]		022540 022590 02250 022510 022510	
370	115	HMIN H H = HC WRITE FORMAT	CUT * HCUT (6 • 1)	S) H H MAS BEEN REDUCED TO	SEEN	REDUC	IIN H HAS BEEN REDUCED TO .E18.8	.8.			02240 022540 022550 022570	
375	150	JSTART GO TO	45 (6.155)		, E	704 30	1051897 # -1 60 70 45 WPITE (6+155) ROBINE (7AM DOUBLE ADDEADS INSCRINANTY)	3 5 6	2	, , , , , , , , , , , , , , , , , , ,	022590 02270 022710 022720	
340	2002	WRITE WRITE	0 TO 500 RITE (6.101) 7.W.EPS	1) 5) T+M+EPS	E & &					6	022740 022750 022750 022770	
385	250	60 TO WEITE	500 (6.101) (6,255)	THE REGU 11) 15) T-EPS	REQUESTED • EPS	- <b>t</b> i	OR 15 TOO	SMALL	FOR INTEG	SMALL FOP INTEGRATOR.//)	052440 052440 052440 052410	
3¢n		FORMA1 2 294 1 2 294 1 KFLAG	255 FOPWAT(//46H INTEGRATION HALTED 1 E1A.8/43H EPS IS TOO SWALL FOR 2 29H PORBLEM REING SOLVED. EPS KFLAG = -2 GD TO 500	TINTEG	8 & T 10 T 00 S S 0 L V	N HAL Hall ED.		BY SHRROUTINE MACHINE PPECI =+E18.8//)	BY SHAPOUTINE DRIVE AT MACHINE PPECISION AND/ =+E19+8//)	# H F-	022450 022450 022450 022470 022840	
305 5	300	WPITE WOITE FORMAL		S) T * KFLAG *CTOP C	= =3 03v40	FROM GENCE	6.101) 6.305) T //34M KFLAG = -3 FRAM INTEGRATAR AT I =.F19.A CAPPFCTAP CONVERGENCE CONLO PAT OF ACHTEVED/)	IR AT T	=*E14.3/ *JEVED/)		022410 022410 022920 022920	

SHRANUTINE DAIVE	E NRIV		76/76	)PT=1 0	QONND=++*/ TRAC	*/ TRACE	Z L		<b>4.</b> 8+40]	58/22/20	13.15.44
00+	,	50 TO 11	110							05250	
• •	, <b>4</b> 00 4	WRITE WRITE FORMAT	(6.101) (6.405) (//35H	WRITE (6.101) WRITE (6.405) EPS WRITE (7.35H ILLEGAL INPUT	IMPUT.	EDS .EE. 0.	EPS # •(	•E19.9//)	5	022470 02240 022440	
Ç		INDEX .	<b>:</b>							023000	
410	410 415	WRITE (CEORMATC)	(6.101) (6.415) (7/31H	N ILLEGAL	N ILLEGAL INPUT	Z .0	1/61.	_		023020 023030 023040 023950	
415	\$24	WRITE (C VD ITF (C FORMATC)	(6.101) (6.425) (//39H 0 == £1A	WRITE (6.101) WPITF (6.425) TO.TOUT.HO FORMAT(//39H ILLFGAL INPUT SH TO *.E19.A.7H TOUT #:E1		(TO - TO!IT) +HO	TO!!T) • HO . GE. HO = • E18. A//)			023090 023100 023100 023110 023120	
420 475	639 435	WRITE (PEOPERT)	(6.101) (6,435) (7,24H	WRITE (6,101) WRITE (6,435) INDEX FORMATI(/24H ILLEGAL INDEX = -4 RETURN	IMPUT INDEX	INDEX #+18//)	ç			023150 023140 023140 023190 023200	
<b>*</b> 30	3 4 4 T		66.10 66.44 67.4 48.4 46.4 46.4 46.4	6.101) 6.445) N (//39H ILLEGAL INPUT. 43H DIFFERENTIAL EQU. 42H STORAGE ALLOCATI 46H TOO SWALL. SEE.	INPUT. IAL EQUA LLOCATIO	1) N ILLEGAL INPUT. THE NUMBER OF OPDINARY/ H ILLEGAL INPUT. THE NUMBER OF OPDINARY/ ODFFERENTIAL EQUATIONS BEING SOLVED IS N =. STORAGE ALLOCATION IN SUBROUTINE DRIVE IS/ TOO SWALL. SEE COMMENTS IN SUBBOUTINE DRIVE	OF OPDINARY/ SOLVED IS W INE DRIVE IS	1887/ 15 18. 16 081VE	. 16/ .ve./)	023210 023220 023230 023240 023250 023250	
435	450	WRITE (	(6,101)	T.TOUT.H	z					023390 02330 023310 023320	
0 *	က နေန ကို	FOPMAT(//461 1 44H 2 41H 3 4H T	FOPMAT(//46H INDEX 44H INTERPOI 41H OESIRED CALL INTERP (701118.5	INDEX = -1 ON NTERPOLATION WA ESIRED PARAMETE #*EIA*** TOUT	SM INDEX = -1 ON INPUT WITI INTERPOLATION WAS DONE AS DESIRED PARAMETER CMANGES I MEERASAPP TOUT = +EIR,89,		1 (T - TOUT) +4 . ON NORMAL RETUR WEPE NOT MADE./ HH H #.E18.A//)	4 .6F		020010 020040 020040 020050	
***		TO = TOI INDEX = RETIJAN								023390 023400 023410	
€ 5	ر 440 د 445	WPITF (6.101) WOITE (6.465) T.TO! FORMAT(//45H INDEX I 4H T =:E18.8.7H	(6.101) (6.465) (//45H I T =:E18.	T+T0!JT+H  NNEX	1-101) 1-465) T-FOUT-H 7-45H INDEX = 2 ON INPUT WITH ==E18.8-7H TOUT =-E18.9-4-H H	- <u>"</u>	(T - TOUT)*H =.E18.8//)	ييا ع	`.		
) \$ \$ <b>4</b>	ر اود ا	<b>Z</b> ⊢								023490 023500 023510	

A trade described described betrevers a bespected and open bestrevers assessed assisting and approximate the s Second described assistant and second described and and approximate assistant and approximate the second described and app

PAGE

	SU 180UTINE DRI	. NP IVE	76/76	e G	~ [= <u>+</u>	OPTHI ROUNDHAMA TRACE	181	ال • ناد	 C = // > // > // O f	**************************************	i L	
		7 012 7 012 7 018	510 1 a	F 1.N Y([.]) TAG				•	023520			
•	460	10 H O B B B B B B B B B B B B B B B B B B	TOP = TO HO = HUSED IF (KFLAG .NE. D) HO = H BFTIBN	.NE.	91	I H			023550 023550 023570 023580			
ā	594	CC			:	ND OF SL	JBP-0U'	END	_			
2	BO NR. SEVERITY DET	DETAILS		DIAGNOSIS OF PROBLEM	OF PR	ORLEH						

AN IF STATEMENT MAY BE MORE EFFICIENT THAN A 2 OR 3 RPANCH COMPUTED 60 TO STATEMENT. AN IF STATEMENT MAY BE MORE EFFICIENT THAN A 2 OR 3 RPANCH COMPUTED 60 TO STATEMENT.

	ALIEBOLITHE INTERPORTATION YOUNG YOU	017670	
_	C	023620	
	C VARIABLE Y AND STOPES THEW IN YO. THE INTERPOLATION IS TO THE	023640	
ır	C BOINT I = TOUT AND USES THE NORDSIECK MISTORY APRAY Y AS FOLLOWS.	023650	
	ON	023450	
	• T++S+(I+T+I)A WIS = (1)OA	023670	
	0 N O	023690	
	C WHERE S = -(T-TOUT)/H.	023630	
	•	053700	
	C CAUTION NOT ALL MEMBERS OF EPCOMI AGE USFD IN THIS SHIRROUTINE.	023710	
	C	023720	
	U	023730	
	DIMENSION YOUND) + Y (NO + 13)	023740	
15	ပ	023750	
	COMMON /EDCOM1/ 1.H.HMIN.HMAX.EPS.4S.UROUND.N.MF.KFLAG.USTART	023750	
	ONE 1 . 0	023770	
	U	023790	
	DO 10 I = 1.N	023790	
20	10 YO(I) = Y(I+1)	023400	
	L = USTAPT + 1	023410	
	S # (1001 + 1)/H	023920	
	S1 # ONE	023830	
	00 30 J = 2°F	023840	
25	SI N SI &S	023850	
	Nº1 = 1 02 00	023460	
		023470	
	30 CONTINUE	023890	
	RETURN	023890	
30	Carrenterment of the Control of Subbouling Interparations	053900	
•			

AND HER SCALED DEPIRATIVES. LAMA IS COMPENTLY 6 FOR THE YOUNGESTED BEDIATIVES. LAMA IS COMPENTLY 6 FOR THE YOUNGESTED BEDIATIVES. LAMA IS COMPENTLY 6 FOR THE YOUNGESTED BEDIATIVES. LAMA IS COMPENTLY 6 FOR THE YOUNGESTED BEDIATION FEMALE STEP AND THE STEP SIZE TO BE ATTEMPTED ON THE WEST STEP TAKEN, THE SALPINO BE THE PROPERTY ON THE WEST STEP TAKEN, THE SALPINO BE THE PROPERTY ON THE WEST STEP TAKEN, THE SALPINO BE THE PROPERTY ON THE WEST STEP TAKEN, THE SALPINO BE THE PROPERTY ON THE WEST STEP THE YOUNGHOUT THE PROPERTY ON THE WEST STEP THE YOUNGHOUT THE PROPERTY.  THE YOUNGHOUT THE PROPERTY HAN, THE WEST STEP TAKEN, THE SALPINO STEP THE YOUNGHOUT THE PROPERTY ON THE WEST STEP THE YOUNGHOUT THE YOUNGHOUT THE YOUNGESTED TO STEP THE YOUNGHOUT THE YOUGH HAND.  ANY THRE SHED FOR THE STEP THE SEE WEST FEATURED OF THE YOUNGH SHOWN.  THE WINTHOM AND MAXIMUM ASCOLUTE WALLE FEET UNTIL THE WANTEN.  ANY THRE SHED FOR THE STEP, THESE MAY BE CHANGED AT A CONTON. A DEFAULT VALUE OF DIS USED FOR THE YOUNGH SHOWN THE WEST STEP.  SURPOUTINE DIVE.  SURPOUTINE DIVE.  SURPOUTINE SHOW SON YOUNGH SHOWN THE WAY OF A CONTON.  THE WUMPER OF FIRST OPDER ORDINANT SHOWN OF THE LAST  ON THE MUMBER OF FIRST STEP THE SHOWN OF THE LAST  THE MUMBER OF FIRST STEP THE STEP THE AST  ON THE MUMBER OF THE STEP THE STEP THE AST  ON A RETURN WITH THE ASS SUCCESSUR.  THE RETURN SHIP THE STEP THE STEP THE AST  ON A RETURN WITH THE ASS SUCCESSUR.  JITHER AND HIS THE LAST STEP THE ELBST  ON A RETURN WITH THE ASS SUCCESSUR.  A THE RETURN WITH THE ADDIT THE LAST  STEP AND HIS THE LAST STEP THE SALD HIS SWALLS.  THE PROPERTY OF THE STEP THE STEP THE SALD HIS THE LAST OF THE STEP THE S		TSTEP PEPFORMS ONE STEP OF THE INTEGRATION OF AN INITIAL VALUE PROPIEM FOR A SYSTEM OF ORDINARY DIFFERENTIAL EDUATIONS.
AND 13 FOR THE VARIABLE STEP AND STEP OR THE VARIABLE STEP AND HE WAS INCOME.  SEE SIMPOUTIVE COSTT. Y (1,3-1) CONTAINS THE JUTH OFFER VARIETY THE MAINING DOOR WORDS.  A CONSTANT INFEGRA GE. W. WEED FOR DIMENSIONING DOOR STEP TAKEN. H. IS ALTERED BY THE ERROR CONTROL ALGORITHM DIMENSIONES.  THE STREAM OF THE PROBLEM W. CONTAIN THE STEP TAKEN. H. IS ALTERED BY THE ERROR CONTROL ALGORITHM DIMENSIONES.  THE SOLITION OF THE PROBLEM, W. CAN PRETIATE POSITIVE THROUGHOUT THE PROBLEM RIV.  THROUGHOUT THE PROBLEM RIV.  THE MINIMUM AND MAXIMUM ASSOLUTE VALUES OF THE STEP THROUGHOUT THE PROBLEM RIV.  SIZE TO RE USED FOR THE STEP THESE WAY BE CHANGED AT ANY TIME. BUT THE CHANGE WILL NOT TAKE EFFECT UNTIL THE PROBLEM STEP THROUGHOUT THE PROBLEM STEP. SEE SUBPOUTINE DRIVE. CONTYON. A DEFAULT VALUE OF 0 IS USED FOR REPORT CONTYON. SEE COSCRIPTION IN SURBOUTINE DRIVE. CONTYON. A DEFAULT VALUE OF 0 IS USED FOR THE COMPUTER BEING 185D.  THE NUMBER OF STREAM STEP. SEE SUBPOUTINE DRIVE. CONTYON. THE WITH THE FOLLOWING MEANINGS  THE NUMBER OF STREAM SOLUTES TO PROBLEM THE SEE THE ACHIEVED WITH THE PROBLEM SOLUTINE DRIVE. THE WINNESS  THE RELATIONS BEING SOLUTINE OF THE COMPUTER BEING 185D.  THE WINNES BEING SOLUTINE SOLUTINE DRIVE. THE WINNESS  THE RELATIONS BEING SOLUTINESS  THE RELATIONS BEING SOLUTINEST THE STEP WITH SHE LAST STEP ACHIES OF TAND WEANINGS  JATARY AND HIS THE LAST STEP SIZE ATTEMPTED.  ON A RETURN MITH KELAS DEFENCE THE WINNESS  ON A RETURN MITH KELAS OF THE FOLLOWING SOLUTING FOOM THE LAST STEP WITH SHE SOLUTINEST OF THE WINNESS  ON HEY A ARRAY AND AS OF THE FOLLOWING SOLUTING FOOM THE LAST STEP WITH SHE SOLUTINEST OF THE WINNESS OF THE WINNESS OF THE SOLUTING SOL		BY LMAX APPAY CONTAINING THE DEPENDENT VARIABLES THEIR SCALED DEPIVATIVES. LMAX IS CUPPENTY 6 FO VARIABLE STEP BACKMARD OTFERENTIATION FROMIN AC-
A CONSTANT UPGER SEE, N. USED FOR DIFFUSIONING PURPOSES.  THE TIMEPENDENT VARIABLE, UPDATED ON EACH STEP. H IS ALTERED BY THE RROBE CONTOOL ALGORITHM DIDING THE SOLVITION OF THE PROBLE*, H CAN BE ETTHER POSITIVE OR NEGATIVE. BUT ITS SIGN WUST REMAIN CONSTANT THROUGHOUT THE PROBLE*, H CAN BE ETTHER POSITIVE OR NEGATIVE. BUT ITS SIGN WUST REMAIN CONSTANT THROUGHOUT THE PROBLE*, H CAN BE EFFECT UNTIL THE NEXT CHANGE IN H IS MADE.  EPS SIZE TO HE USED FOR THE STEP, THESE MAY BE CHANGED AT ANY THRE BUTHUND. SEE DESCRIPTION IN SURBOUTINE DRIVE. UROUND THE PURIT OF ROUNDOF FOR THE COMPUTINE DOTVE. CONTOQL. A DEFRAULY VALUE OF 0 15 USED FOR ERROR CONTOQL. A DEFRAULY VALUE OF 0 15 USED.  FUE WETHOU FOR DOUNDOF FOR THE COMPUTINE DOTVE. UROUND THE UNIT OF ROUNDOFF FOR THE COMPUTINE DOTVE.  ON THE USED FOR SIZE OF STEP.  FUE WETHOD FLAS.  EQUIPMEN WITH THE FOLLOWING MEANINGS  ON THE STEP OF STEP STEP SHOW OF THE LAST STEP AND H IS THE LAST STEP STEP.  ON A RETURN WITH THE FOLLOWING VENING OF THE LAST STEP AND H IS THE LAST STEP STEP.  ON THE V ARPAR ARE AS OF THE REQUESTED FOR THE LAST STEP AND H IS THE LAST STEP STEP.  ON THEY VARIAT ARE AS OF THE REQUESTED FOR THE LAST STEP AND H IS THE LAST STEP WITH A NEW VALUE OF  ON PREFITED ON THE WESTER THEY AND WITHOUT OF  ONE STEP AND H IS THE LAST STEP WITH A NEW VALUE OF  ONE STEP AND H IS THE LAST STEP WITH A NEW VALUE OF  ONE STEP AND H IS THE DOT ON THE CHURCH OF  ONE STEP AND H IS THE DOT ON THE CHURCH OF  ONE STEP AND H IS THE DOT ON THE WENT STEP  ON INVESTED USED ON THE STEP WITH A NEW VALUE OF  ONE STEP AND H IS THE DOT ON THE WITH A NEW VALUE OF  ONE STEP AND H IS THE DOT ON THE WESTER WITH A NEW VALUE OF  ONE STEP AND H IS THE DOT ON THE WESTER WITH A NEW VALUE OF  ONE STEP AND H IS THE DOT ON THE WESTER WITH A NEW VALUE OF  ONE STEP AND H IS THE DOT ON THE STEP STEP STEP  ONE STEP AND H IS THE DOT ON THE WESTER WITH A NEW VALUE OF  ONE STEP AND HIS TO NOT THE WESTER WITH A NEW VALUE OF  ONE STEP AND HIS STEP STEP STEP STEP STEP STEP STEP STE		AND 13 FOR THE WARIANCE STEP ARMY FORMULAS.  (LVAX -1) = MAXDEQ. THE MAYIMUM OPDER USED.  SEE SURPOUTIVE COSET. Y(1.0-1) CONTAINS THE  J-TW DERIVATIVE OF Y(1).
THE SILE JILE IN BE ATTCHAPTED IN IN THE PROPERTY MEATS THE PROPERTY HE ERPORAGE WHICH ALGORITHM DIDPING THE SOLUTION OF THE PROBLEW, HICAN PE EITHFR POSITIVE OR MEGATIVE, BUT ITS SIGN WUST REMAIN CONSTANT THROUGHOUT THE PROBLEM, HICAN PE EITHFR POSITIVE THROUGHOUT THE PROBLEM, HICAN PE EITHFR POSITIVE SIZE TO BE USED FOR THE STEP, THESE MAY BE CHANGED AT ANY THME, BUT THE CHANGE WILL MOT TAKE EFFECT UNTIL THE NEXT CHANGE IN HIS MADE, SEE DESCRIPTION IN SURPOUTINE DRIVE, THE SIZE OF THE TIME INTERVAL TO BE USED FOR ERROR CONTONICE CONTONIC OF ERROR PER SIZE OF THE TOWN TO BE OBSIDED TO PRODUCE CONTONIC CONTONIC OF FIRST PODER ORDINARY OIFFERENTIAL EQUALIONS BEING SON VED.  THE WHIT OF ADUNDOFF FOR THE COMPUTER BEING HISED.  THE WINT OF ADUNDOFF FOR THE COMPUTER HEND CAN BE USED FOR THIS PROPER.  A COMPLETION CODE WITH THE FOLLOWING MEANINGS  O THE STEP WAS SUCCESFUL.  THE REQUESTED ERROR COULD NOT RE ACHIEVED FOR THIS PROPER.  -3 CORRECTOR CONVERGENCE COULD NOT RE ACHIEVED FOR THIS PROPER.  -4 THE REQUESTED ERROR DISTORE THE LAST STEP SIZE ATTEMPTED.  ON A RETURN WITH KFLAG NEGRITUE. THE VALUES OF T AND THE Y APPAY ARE AS OF THE REGILES ERFORMING OF THE LAST STEP SIZE ATTEMPTED.  ON INDIT. IT HAS THE FOLKT STEP.  OF DEPORPOR THE FIRST STEP SIZE ATTEMPTED.  OF DEPORPOR THE FIRST STEP WITH A NEW VALUE OF THE LAST STEP MITH A NEW VALUE OF THE CLIDAGENT OF THE CL		A CONSTANT INTEGER .GE. N. USED FOR DIMENSIONING PURPOSES. THE INDEPENDENT VARIABLE. UPDATED ON EACH
HMIN, THE MINIBUL AND MAXING THE STEP, THESE MAY BE CHANGED AT ANY TIME, BUTT THE STEP, THESE MAY BE CHANGED AT ANY TIME, BUTT THE STEP, THESE MAY BE CHANGED AT ANY TIME, BUTT THE WANGE WILL NOT TAKE EFFECT UNTIL THE NEXT CHANGE IN H IS MADE, SEE OCSCRIPTION IN SUBPOUTINE DRIVE, SS THE SIZE OF THE THE INTERVAL TO BE USED FOR ERROR CONTROL. A DEFAULT VALUE OF 0 15 USED FOR ERROR CONTROL. OF ERROR PER STEP, SEE SUBPOUTINE DOTVE, THE UNIT OF ROUNDOF FOR THE COMBUTER BEING 105D.  IN THE WAIT OF ROUNDOF FOR THE COMBUTER BEING 115ED.  IN THE WETHOD FLAG. SEE DESCRIPTION IN SUBPOUTINE DRIVE, FLEW HELD FLOW THE FOLLOWING MEANINGS  OF THE STEP WAS SUCCESFUL.  IN THE RETURN WITH THE FOLLOWING MEANINGS  ON THE REQUESTED ERROR COULD NOT BE ACHIEVED FOR THE STEP SIZE ATTEMPTED.  ATH ARSIN'S HAIN.  ON A RETURN WITH KFLAS FOR SIZE ATTEMPTED.  ON INDIT, IT HAS THE LAST STEP SIZE ATTEMPTED.  ON INDIT, IT HAS THE FOLLOWING FOW THE LAST STEP AND HIF OF THE OR THE OF THE OFF.  ON INDIT, IT HAS THE FIRST STEP.  ON INDIT, IT HAS THE FIRST STEP.  ON INDIT, IT HAS THE FIRST STEP WITH A NEW VALUE OF THE MANDON HANDON H		THE STEP SIZE TO BE ATTEMPTED ON THE NEXT STEP.  H IS ALTERED BY THE ERROP CONTROL ALGORITHM DUBING  THE SOLUTION OF THE PROBLEW. H CAN PE EITHER POSITIVE OR NEGATIVE.  THEORYCHOLIT THE BODGE SIGN MUST REMAIN CONSTANT  THORNCHOLIT THE BODGE SHIM
THE RELATIVE BROOM BOUND. SEE OESCRIPTION IN SURPOUTINE DRIVE.  SS THE SIZE OF THE THE INTERVAL TO BE USED FOR ERROP CONTROL. A DEFAULT VALUE OF 0 15 USED FOR ERROP CONTROL. OF ERROP PER SYEP. SEE SUBPOUTINE DOIVE.  URDUND THE UNIT OF ROUNDOFF FOR THE COMPUTER BEING 11SED.  I THE UNIT OF ROUNDOFF FOR THE COMPUTER BEING 11SED.  I THE WETHOD FLAG. SEE DESCRIPTION IN SUBPOUTINE DRIVE.  I THE WETHOD FLAG. SEE DESCRIPTION IN SUBPOUTINE DRIVE.  OF THE STEP WAS SUCCESFUL.  I THE REQUESTED ERROP COULD NOT RE ACHIEVED WITH ARSIH) & HMIN.  ON A RETURN WITH KFLAG MEGATINE, THE VALUES OF TAND THE Y ARRAY ARE AS OF THE REGIVENCE.  JSTARY ARRAY ARE AS OF THE REGIVENCE.  ON INDIT. IT HAS THE FOLLOWIN: VALUES AND MEANINGS  ON INDIT. IT HAS THE FIRST STEP.  ON INDIT. IT HAS THE HEAT STEP.  ON INDIT. IN TAKE A NEW STEP COUNTER IN THE LAST.  ON INDIT. IN TAKE THE NEW STEP WITH A NEW VALUE OF THE HAD NOW HE NOW STEP.  ON INDIT. IT AND HAD NOW HE CHAPPER STEP.  ON INDIT. IN TAKE THE NEW STEP WITH A NEW VALUE OF THE CHAPPER.		THE MINIMUM AND MAXIMUM ABSOLUTE VALUES OF THE STEP SIZE TO BE USED FOR THE SIEP, THESE MAY BE CHANGED AT ANY TIME, BUIT THE CHANGE WILL NOT TAKE EFFECT UNTIL THE MEY CHANGE TO MAY BE AND THE CHANGE WILL NOT TAKE EFFECT UNTIL THE MEY CHANGE TO MAY AS MAND
URDUND THE UNIT OF ROUNDOFF FOR THE COMPUTER BEING 1956.  THE NUMBER OF FIRST OPDER ORDINARY DIFFERENTIAL  EQUATIONS BEING SOLVER  THE WETHOD FLAG. SEE DESCRIPTION IN SUBPOUTINE DRIVE.  THE METHOD FLAG. SEE DESCRIPTION IN SUBPOUTINE DRIVE.  OTHE STEE MAS SUCCESFUL.  THE REQUESTED ERROR COULD NOT BE ACHIEVED MITH ARSIH) = HMIN.  -2 THE REQUESTED EPROR IS SMALLER THAN CAN BE HANDLED FOR THIS PROBLER.  -3 CORPECTOR CONVERGENCE COULD NOT BE ACHIEVED FOR THIS PROBLES.  ON A RETURN MITH KFLAG NEGATIVE. THE VALUES OF T AND THE Y APRAY ARE AS OF THE REGINNING OF THE LAST STEP SIZE ATTEMPTED.  ON INDIT, IT HAS THE FOLLOWING POW THE LAST.  ON INDIT, IT HAS THE FOLLOWING FOW THE LAST.  ON INDIT, IT HAS THE FOLLOWING FOW THE LAST.  ON EMPTONE THE NEXT STEP SIZE ATTEMPTED.  ON EMPTONE THE NEXT STEP WITH A NEW VALUE OF THE LAST.  CLT.O TAKE THE NEXT STEP WITH A NEW VALUE OF THE LAST.  ON EXPLANT JATAT IS SET TO NOT THE CURPLENT DROPER OF THE NAVORD HAS STEP WITH A NEW VALUE OF THE CONTENT STEP WITH A NEW VALUE OF THE COURSE.	SS S	THE RELATIVE ERROR BOUND. SEE DESCRIPTION IN SUBPOUTINE DRIVE.  THE SIZE OF THE TIME INTERVAL TO BE USED FOR ERROR CONTONL. A DEFAULT VALUE OF 0 IS USED TO PRODUCE CONTROL OF ERROR PER SYFD. SFE SUBPOLITINE DRIVE.
ACLEAR A CURTEL TOTAL COOK WITH THE PSECULATION MEANINGS.  -1 THE REQUESTED ERROR COULD NOT BE ACHIEVED WITH ARS H) = HAIN.  -2 THE REQUESTED ERROR IS SMALLER THAN CAN BE HANDLED FOR THIS PROBLER.  -3 CORRECTOR CONVERGENCE COULD NOT RE ACHIEVED FOR THIS PROBLER.  -3 CORRECTOR CONVERGENCE COULD NOT RE ACHIEVED FOR THIS PROBLER.  -3 CORRECTOR CONVERGENCE COULD NOT RE THE Y ARRAY ARE AS OF THE BEGINNING OF THE LAST STEP AND H IS THE LAST STEP SIZE ATTEMPTED.  -3 STEP AND H IS THE LAST STEP.  -4 THE NEW YALUES AND MEANINGS.  -6 TO TAKE A NEW STEP CONTINUING FOOM THE LAST.  -6 TO TAKE THE NEXT STEP WITH A NEW VALUE OF THE NATION OF THE NATION OF THE NATION OF THE CHURCH NOTION OF THE CHURCH NOTION OF THE CHURCH SETT.		THE UNIT OF BOUNDOFF FOR THE COMBUTER BEING 1550. THE NUMBER OF FIRST OPDER ORDINARY DIFFEDENTIAL EQUATIONS BEING SOLVED. THE WETHOD FLASS. SEE DESCRIPTION IN SURPOUTINE DRIVE
THE Y APPRAY ARE AS OF THE BEGINNING OF THE LAST STED AND H IS THE LAST STEP SIZE ATTEMPTED. JSTART AN INVERED USED ON INPUT AND DUTPOUT. ON INPUT. IT HAS THE POLLOWING VALUES AND MEANINGS OF PEPROPH THE FIRST STEP.  OT OF TAKE A NEW STEP CONTINUING FDOM THE LAST.  LITO TAKE THE NEXT STEP WITH A NEW VALUE OF HANDONED OF THE		THE STEP WAS SUCCESFUL. THE STOUESTED EGROP COULD NOT BE ACHTE WITH ABS(4) = HMIN. WITH ABS(4) = HMIN. WE ROUGESTED EGROP IS SMALLER THAN CA BE WANDLED FOR THIS PROMLEY. CORPECTOR CONVERGENCE COULD NOT BE ACHIEVED FOR ABS(4) = HMIN.
		THE VENE STEP AND STEP AND AN INVERED ON INVITA- 61.0

ESTRATE, COMPONING TO BE SET HE STANDOLLY TO STANDOLLY TO STANDOLLY TO SAVE:  TO SAVE: TO SAVE: TO SAVE: TO ADARYS FOR MONNING STORED. SAVE: ENGL FOR THE MESTER TO THE PARTIAL DESTRATIVES OF THIM RESPECT TO TENTH SAVE STORED.  THO AN INTEGER AND TO ELEMENT SAVE STORED.  THE COMMON BLOCK EPCHIO DECLARED BELDW. IS DEFINED FOR PIVOT TO STORED.  THE COMMON BLOCK EPCHIO DECLARED BELDW. IS PRIMABLLY.  COMMON TOWN TO STORED.  COMMON TOWN TOWN TO STORED.  COMMON TABLY TO STORED.  COMMON TABLY TO STANDOLD. SECHEN INTER SAVE TOWN TO STORED.  COMMON TABLY TO STANDOLD. SERVE HILL STANDOLD. SAVE NOT COMMON TABLY TO STANDOLD. SAVE STANDOLD. S				•		
ESTITUTED COLL ERROR IN Y(II) PER SS UNITS JF  TO PER STEP IN SIREDIL IN Y(II) PER SS UNITS JF  EACH OF LENGTH M,  INFERED ANNAY OF LENGTH M, WHICH IS USED FOR PER  COMPANY OF LOCATIONS USES THE LINER ALGERACE SYSTEW IN THE  COMMON TREET OF WHICH SHOULD BE LAND M,  OTHER SIGN WARKIND ERROR FOR THE LINER ALGERACE SYSTEW IN THE  COMMON TREATON FOR THE LINER ALGERACE SYSTEW IN THE  COMMON TREATON FOR THE LINER ALGERACE SYSTEW IN THE  COMMON TREATON FOR THE LINER ALGERACE SYSTEW IN THE  COMMON TREATON FOR THE LINER ALGERACE SYSTEW IN THE  COMMON TREATON FOR THE LINER ALGERACE SYSTEW IN THE  COMMON TREATON FOR THE LINER ALGERACE SYSTEW IN THE  COMMON TREATON FOR THE LINER ALGERACE SYSTEW IN THE  COMMON TREATON SOURCES, WHEN HITE TO SOURCE SYSTEW IN THE  COMMON TREATON SOURCES OF STEPLING IN THE LINE ALGERACE SYSTEW  COMMON TREATON SOURCES SECTION TO SOURCE SOURCES  COMMON TREATON SOURCES SECTION SOURCES  COMMON TREATON SOURCES SECTION SOURCES SOURCES  COMMON TREATON SOURCES SECTION SOURCES SOURCES  COMMON TREATON SOURCES SOURCES SOURCES SOURCES  COMMON TREATON SOURCES SECTION SOURCES SOURCES  COMMON TREATON SOURCES SOURCES SOURCES SOURCES  COMMON TREATON SOURCES SOURCES SOURCES SOURCES SOURCES  COMMON TREATON SOURCES S	,	60003	N ELEMENTS.		24490	
TO A RANGE TO THE STATE THE SAVEL TO A RANGE TO A SAVE.  SAVE.  EACH OF LEGATIONS USED FOR THE PARTIAL DEGIVATIVES  OF WITH WESECT TO Y. IF WITE IS NOT 0. SEE  OF WITH WESECT TO Y. IF WITE IS USED FOR PLOTE  I PLY AN INTEGER AND TO ELUCITUM. WHITELE IS NOT 0. SEE  COMMON TO SECRETION TO SERVE THE WITE IS USED FOR PLOTE  COMMON TO SECRETION FOR THE LINEAR AGENTALY.  COMMON TO SERVE THE SECRETION TO SERVE THE WHITE IS USED FOR PLOTE  COMMON TO SERVE THE		,	FSTIMATED LOCAL FORDS TN VITY DER SS INVITS OF		24500	
SAVE: TWO MORPHY FOR UNKINGS STORAGE.  SAVE: RAINED CONTROLLING STORAGE.  PAY AND THE FEBERATION OF PRINTING STORAGE.  OF COTHINGS AND AND STORAGE.  OF COTHINGS AND AND STORAGE.  AND THE STORAGE.  AND THE STORAGE.  OF COTHINGS AND AND STORAGE.  AND THE STORAGE.  OF COTHINGS AND AND STORAGE.  OF COTHINGS AND STORAGE.  OF			A CO STATE OF THE CONTRACT OF			
SAVE: TWO ABOAYS FIND MORRING STDAGE.  SAVE: TWO ABOAYS FIND WORKING STDAGE.  SAVE: A BLOCK OF LOCATIONS USED FOG THE PABTIAL DEGIVATIVES  OF FILTH WESECT TO Y. IF WITE IS NOT 0. SEE  DESCRIPTION TO FIND THE LINEAR ALCERRACE SYSTEM IN THE  COPPERTY OF THE LINEAR ALCERRACE SYSTEM IN THE  COPPONING ASVELLED TO THE LINEAR ALCERRACE SYSTEM IN THE  COPPONING TRANSPORTED TO THE LINEAR ALCER STATEM IN THE THE TO THE SYSTEM IN THE SYS			OF THE SILE (UP SIZE H).	5	016.2	
C SAVE EACH OF LEGGET NO. TE MITE AND THE PARTIAL DEGVATIVES  OF STHIM WESSEL TO Y. IF MITE SECONDING DOILS.  OF STHIM WESSEL TO Y. IF MITE SECONDING DOILS.  C THE COMMON TO THE LINEAR ALGEBALLY STEEM IN THE COMMON TO THE LINEAR ALGEBALLY.  C THE COMMON END THE LINEAR ALGEBALLY.  C THE COMMON END THE LINEAR ALGEBALLY.  C THE COMMON TABLY THAN THAN THAN THE THAN THE THAN THE THE THAN THAN THAN THAN THAN THAN THAN THAN	U	SAVE1.	TWO ARPAYS FOR WORKING STODAGE.	_	24520	
PAY NO FOURTH MAY NO LOCATIONS USED FOR THE PREFITAL DEGYATIVES  C DEF WITH GESECT TO Y, IF MITER IS NOT O. SEE  DESCRIPTION TO RESPOND TO LEVITH WHICH IS USED FOR PURPLY  C DESCRIPTION FOR THE LINER ALGEBRIC SYSTEW IN THE  C DESCRIPTION FOR THE LINER ALGEBRIC SYSTEW IN THE  C DESCRIPTION FOR THE LINER ALGEBRIC SYSTEW IN THE  C DESCRIPTION FOR THE LINER ALGEBRIC SYSTEW IN THE  C DESCRIPTION FOR THE LINER ALGEBRIC SYSTEW IN THE STATEMENT OF THE LINER ALGEBRIC SYSTEW IN THE STATEMENT OF THE LINE SYSTEMENT OF THE COMMONY TABLY SYSTEM FOR THE SYSTEMENT OF THE COMMONY TABLY SYSTEMENT OF THE LINE SYSTEMENT OF THE COMMONY TABLY SYSTEMENT OF THE LINE SYSTEMENT OF THE COMMONY TABLY SYSTEMENT OF THE LINE SYSTEMENT OF THE COMMONY TABLY SYSTEMENT O	U	SAVE		•	24530	
Properties   Pro		3	A BLOCK OF LOCATIONS HEED FOR THE DADITAL		34540	
OF FOR THIN RESERVED TO SERVED TO SEE  OF THE COMMON BROCFES, WIRM HITPE = 1 OR 2.  C THE COMMON BROCFES, WIRM HITPE = 1 OR 2.  C THE COMMON BROCFES, WIRM HITPE = 1 OR 2.  C THE COMMON BROCFES, WIRM HITPE = 1 OR 2.  C THE COMMON BROCFES, WIRM HITPE = 1 OR 2.  C THE COMMON BROCFES, WIRM HITPE = 1 OR 2.  C THE COMMON FOR THE WOULD SEE CITTLE RA. THERTLY.  C THE COMMON FOR THE WOULD SEE CITTLE RA. THERTLY.  C THE COMMON FOR THE WOULD SEE CITTLE RA. THERTLY.  C THE COMMON FOR THE WOULD SEE CITTLE RA. THERTLY.  C THE COMMON FOR THE WOULD SEE CITTLE RA. THERT RA. THORP RA. THE RA.	۱ و		THE THE TANK OF THE TANK THE T		10000	
C THE COMMON AND THE LINERAL ALGEBRAIC SYSTEM IN THE COMMON AND THE CLUSTH N. WHICH IS USED FOR PIUTE COMMON AND THE LINERAL ALGEBRAIC SYSTEM IN THE COMMON AND THE CLUSTH N. WHICH IS USED FOR PIUTE COMMON AND THE CLUSTH N. WHICH IS USED FOR PIUTE COMMON THE LINERAL ALGEBRAIC SYSTEM IN THE COMMON THE CLUSTH SHAPPEN STORE AND THE COMMON THE CLUSTH SHAPPEN STORE AND THE COMMON THE COMM			OF F WITH RESPECT TO T. IF MITEM IS NOT O. SE		24550	
C THE COMMON RUCK FORTH ELYBER ALGEBRAIC SYTEW IN THE ELYBER ALGEBRAIC SYTEW IN THE COPPERTION FOR THE LINERA ALGEBRAIC SYTEW IN THE COPPERTION FOR THE LINERA ALGEBRAIC SYTEW IN THE COMMON RUCK FOR THE LINERA ALGEBRAIC SYTEW IN THE COMMON RUCK FOR THE LINERA ALGEBRAIC SYTEW IN THE COMMON RUCK FOR THE LINERA BELOW. IS PRIMALLY.  COMMON TRANSION SYRESHING.  COMMON TRANSION.			DESCRIPTION IN SUBROUTINE DRIVE.		24560	
COMMON_TRAILY TRAY THE LINE RAIGESTO EXTERNALLY.  COMMON_TRAILY TO REACCESSTO EXTERNALLY.  COMMON_TRAILY TO REACCESSTO EXTERNALLY.  COMMON_TRAILY TRAY HOLD SECLARED BELOW, HE WHITE REALLY.  COMMON_TRAILY TRAY HOLD SECLARED BELOW HITE REALLY.  COMMON_TRAILY TRAY HOLD SECLARED SECLARED HITE RAILY.  COMMON_TRAILY TRAY HOLD SECLARED SECLARED HITE HAS TO SHOW THE SECLARED SECLARED HITE SECLARED SECLAR	٠	101	AN INTEGRO ARRAY OF LEVETH N. ELICH IN CARD FOR		24570	
THE COMMON BLOCK ECCHIO. DECLARD BELOW. IS PRIMARILY.  C FOR INTERNAL US., BUT IT CAN BE ACCESSED EXTERNALLY.  C FOR INTERNAL US., BUT IT CAN BE ACCESSED EXTERNALLY.  C FOR INTERNAL US., BUT IT CAN BE ACCESSED EXTERNALLY.  C FOR INTERNAL US., BUT IT CAN BE ACCESSED EXTERNALLY.  C FOR INTERNAL US., BUT IT CAN BE ACCESSED EXTERNALLY.  C FOR INTERNAL US., BUT IT CAN BE ACCESSED EXTERNALLY.  C FOR INTERNAL US., BUT IT CAN BE ACCESSED EXTERNALLY.  C FOR INTERNAL US., BUT IT CAN BE ACCESSED EXTREMALLY.  C FOR INTERNAL US., BUT IT CAN BE ACCESSED EXTREMALLY.  C FOR INTERNAL US., BUT IT CAN BE ACCESSED EXTREMALLY.  C FOR INTERNAL US., BUT IT CAN BE ACCESSED EXTREMALLY.  C FOR INTERNAL US., BUT IT CAN BE ACCESSED EXTREMALLY.  C FOR INTERNAL US., BUT IT CAN BE ACCESSED EXTREMALLY.  C FOR INTERNAL US., BUT IT CAN BE ACCESSED EXTREMALLY.  C FOR INTERNAL US., BUT IT CAN BE ACCESSED EXTREMALLY.  C FOR INTERNAL US., BUT IT CAN BE ACCESSED EXTREMALLY.  C FOR INTERNAL US., BUT IT CAN BE ACCESSED EXTREMALLY.  C FOR INTERNAL US., BUT IT CAN BE ACCESSED EXTREMALLY.  C FOR INTERNAL US., BUT IT CAN BE ACCESSED EXTREMALLY.  C FOR INTERNAL US., BUT IT CAN BE ACCESSED.  C FOR INTERNAL US., BUT IT CAN BE ACCESSED.  C FOR INTERNAL US., BUT IT CAN BE ACCESSED.  C FOR INTERNAL US., BUT IT CAN BE ACCESSED.  C FOR INTERNAL US., BUT IT CAN BE ACCESSED.  C FOR IT CAN BE ACCESSED.	•		THE STREET OF CONTROL OF THE STREET OF THE S			
COMPONING CORPECTION PROCESSED STERNALLY.  C CONTINUENCE OF ALL TO A BE ACCESSED EXTERNALLY.  C CONTINUENCE OF ALL TO A BE ACCESSED EXTERNALLY.  C CONTINUENCE OF ALL TO A BE ACCESSED EXTERNALLY.  C CONTINUENCE OF ALL TO A BE ACCESSED EXTERNALLY.  C CONTINUENCE OF ALL TO A BE ACCESSED EXTERNALLY.  C CONTINUENCE OF ALL TO A BE ACCESSED EXTERNALLY.  C CONTINUENCE OF ALL TO A BE ACCESSED EXTERNALLY.  C CONTINUENCE OF ALL TO A BE ACCESSED EXTERNALLY.  C CONTINUENCE OF A BE ACCESSED.  C CONTINUENCE OF A COUNTINUENCE OF A BE ACCESSED.  C CONTINUENCE OF A COUNTINUENCE OF A BE ACCESSED.  C CONTINUENCE OF A COUNTINUENCE OF A BE ACCESSED.  C CONTINUENCE OF A COUNTINUENCE OF A BE ACCES	U		INTOPHATION FOR THE LINEAR ALGEERALC SYSTEM IN		245A0	
C THE COMMON BLOCK EPCHIO, DECLARED BELOW, IS PRIMAPILY INTENDED  C FOW INTERNAL USE, BUT IT CAN BE ACCESSED EXTERNALLY.  DIMENSION YIND.13) DIMENSION YARA100.  COMMON/EPCHONIA. THANHIMMAX.EPS, S. UDOUND M.MF. KFL MG. JSTAPT COMMON/TARINY/WHITE KOUTO. SERVE. N.HE. N.HE. N.HE. N.HE. N.HE. COMMON/TARINY/WHITE KOUTO. SERVE. TILLE (A) TVENT(B), TODOP (B), TD IS (A) COMMON/TARINY/WHITE KOUTO. SERVE. TILLE (A) TVENT(B), TODOP (B), TD IS (A) COMMON/TARINY/WHITE KOUTO. SERVE. TILLE (A) TVENT(B), TODOP (B), TD IS (A) COMMON/TARINY/WHITE KOUTO. SERVE. TILLE (A) TVENT(B), TD IS (A) COMMON/TARINY/WHITE KOUTO. SERVE. TILLE (A) TVENT(B), TD IS (A) COMMON/TARINY/WHITE KOUTO. SERVE. TILLE (A) TVENT(B), TD IS (A) COMMON/TARINY/WHITE KOUTO. SERVE. THE A) COMMON/TARINY/WHITE KOUTO. SERVE. SERVE	U			•	24500	
THE COMMON BLOCK EPCHIO. DECLARED BELNW, IS PRIMAPILY INTENDED  DIMENSION YING, 13)  COMMON/EPCDH9, 74U113, 12L113, 7015, 14AX, METH, 100, 17D DP (8), 7D 15 (8), 7D	L				24600	
COMMONTABLY STATEMENT OF CLARK SECTION 1.0 PH (NO.) 10 PH (NO.) 10 PH (NO.) 11 PH (NO.) 11 PH (NO.) 12 PH (NO.) 12 PH (NO.) 13 PH (NO.) 13 PH (NO.) 14 PH (NO.) 14 PH (NO.) 14 PH (NO.) 15 PH (NO.) 14 PH (NO.) 15 PH (NO.) 16	•		Chitation of the contract of t			
C FOW INTERNAL USF, RUT 11 CAN BE ACCESSED EXTERNALLY.  C TOWN TOWN YOUNG THE TOWN ON SAVE (NO) SAVE (NO) SAVE (NO) DIMENSION YMAX (NO) SERROR (NO) SAVE (NO) SAVE (NO) DIMENSION YMAX (NO) SERVE (NO) SAVE (NO) DIMENSION SAVE (NO) DIMENSION SAVE (NO) DIMENSION SAVE (NO) DIMENSION SAVE (NO) SAVE (NO) DIMENSION SAVE (NO) SAVE (NO) DIMENSION SAVE (NO) SAVE (N	ر		N BLOCK EPCHIO: DECLANED SELOW: 15 PRIMEMILT INTEND		01447	
COMMON TERCON STATE STAT			CAN BE ACCESSFO EXTERNALLY	•	24420	
DIMENSION Y(ND.13) DIMENSION Y(ND.13) DIMENSION YAA.NO).EBROR(ND).SAVEI(ND).SAVEZ(ND).PW(NSO).IDIV(ND) DIMENSION YAA.NO).EBROR(ND).SAVEI(ND).SAVEZ(ND).PW(NSO).IDIV(ND) DIMENSION YAA.NO COMMON/TABLYOS.THINESD.NSTEP.NEE.NO COMMON/TABLYOS.THINESD.NSTEP.NSTEP.NEE.NEE.NEE.NEE.NEE.NEE.NEE.NEE.NEE.N	ن ر				26630	
J U				: «	24440	
U U	ر			>		
U U		DIMENS	7 (No.13)	c	124650	
0 0	36	TABLE	CACHE WAY AND TERBORAND ASAVET THE TANK MAY MAN TO THE		24660	
U U		CNILLI	STATE THE PROPERTY OF THE PROP			
U U		DIMENS		•	24670	
J	U			•	24KB0	
5		202200	THE STATE OF THE PROPERTY OF T		24400	
J J		L	Capta Landano Control Managara Capta		200	
5		COMMON	N/EDCOM9/HUSED.NGUSED.NSTEP.NFE.NGE.NMI	e	24700	
0	c	NOMMOL	NATABINIAMBITE SKOHTD SOFC STILLE (B) STVENI (B) STOROD (	3) - TO TS (B) 0	24710	
COMMON/TABL/GR, TAUGES, OFFSET COMMON/TABL/GR, TAUGES, OFFSET COMMON/TABL/GR, TAUGES, OFFSET COMMON/TABL/GR, GAM-CON-ENGES, OFFSET COMMON/TABL/GR, UNC. COMMON/TABL/GR, CA.RMD13.RMD14, WAGE COMMON/TABL/GR, CA.RMD13.RMD34.RMD64.RM1.RM3.RW4.RMSUM-RMINT COMMON/TABL/GR, CA.RMD13.RMD34.RMD64.RM1.RM3.RW4.RMSUM-RMINT COMMON/TABL/GR, DAGES, FFGS, FKS.FKS.FKD4.FKG4.ESUM-EINT COMMON/TABL/GR, DAGES, CA.RMD3.RMC4.RML1.ML3.ML4.M3.H4 COMMON/TABL/GR, DAGES, CA.RMD3.RML3.RMC4.RML1.ML3.ML4.M3.H4 COMMON/TABL/GR, CD.C.C.C.C.C.C.C.C.C.C.C.C.C.C.C.C.C.C.	=					
COMMON/TAB1/GG, GA** COV* ENEY-OFFSET  COMMON/TAB2/CRITI*VII.VPFR  COMMON/TAB2/CRITI*A1.A3.A4A.AMOLE.VCOR  COMMON/TABA/CRITI*A1.A3.A4A.AMOLE.VCOR  COMMON/TABA/CRITI*A1.A3.A4A.AMOLE.VCOR  COMMON/TABA/CRITI*A1.A3.A4A.AMOLE.VCOR  COMMON/TABA/CRITI*A1.A1.A3.A4A.AMOLE.VCOR  COMMON/TABA/CRITI*A1.A1.A1.A1.A1.A1.A1.A1.A1.A1.A1.A1.A1.A		NOMMON	N /EPCMIO/ TAU(13).EL(13).TO(5).LMAX.METH.VO.L.NOIN		24720	
COMMON/TABZ/RK1, RK2.RH11; V11; VPER COMMON/TABZ/RK1, RK2.RH11; V11; VPER COMMON/TABZ/CG.40 CA.RH11; V11; V11; VPER COMMON/TABG.V21, V25, SPS. RH11; V11; V12; CR1 COMMON/TABS/C3, CA.RH113, RH13, P1 + V3.RH3, P10, AP1, RH4.P4, COMMON/TABS/C3, CA.RH113, RH13, P1 + V3.RH3, P10, AP1, RH4.P4, COMMON/TABS/C1, V12, SPS. RH1; P1 + V3.RH3, P10, AP1, RH4.P4, COMMON/TABJ.P4, V10, SPS. SPS. RH1; P1 + V3.RH3, P1, AP1, RH4.P4, COMMON/TABJ.P4, V10, SPS. SPS. RH1, P1 + V3.RH3, P1, AP1, RH4.P4, COMMON/TABJ.P4, V10, RH3, RH4.P4, REJ. RH4.P4, RH4.P4, RH4.P4, REJ. RH4.P4,		NOMMON	X/TAB1/G0.GAM.COV.ENER.OFFSFT	•	24730	
COMMON/TABLZ/FK 1: NEX-KH11: V-FK COMMON/TABLZ/FK 2: V-KH1: V-FK 1: V-FK COMMON/TABLZ/FK 2: V-KH1: V-FK 1: V-FK COMMON/TABLZ/FK 2: V-KF 2: V-KF 2: V-KF 4: V-K-FK COMMON/TABLZ/FK 2: V-KF 2: V-KF 3: V-K-KK-K-KK-K-KK-K-KK-K-KK-K-KK-K-KK-K						
COMMON/TAB3/DC.AVENTAAI.A3AA4.AHOLE.VCOR  COMMON/TAB3/C2.AVERNDI3.A3A4.AHOLE.VCOR  COMMON/TAB4/C3.T.PSTRAV.MODI.W9ACK.MDG.  COMMON/TAB6/C1.VPS.FS.RHI.PI.V3.RHGA.RHI].RHG.RHG.PA.  COMMON/TAB6/PS.RT.PAVEL  COMMON/TAB6/PS.RT.PAVEL  COMMON/TAB6/PS.RT.PAVEL  COMMON/TAB1/PS.RT.PAVEL  COMMON/TAB1/CASI.REGA.EKPS.EKPJ.FKG4.ESUM.EINT  COMMON/TAB1/CASI.REGA.EKPS.EKPJ.FKG4.ESUM.EINT  COMMON/TAB1/CASI.REGA.EKPS.EKPJ.FKG4.ESUM.EINT  COMMON/TAB1/CASI.REGA.EKPS.EKPJ.FKG4.EKLG.  COMMON/TAB1/CASI.REGA.EKPS.EKPJ.FKG4.EKLG.  COMMON/TAB1/CASI.REGA.EKPS.EKPJ.FKG4.EKLG.  COMMON/TAB1/CASI.REGA.EKPS.EKPJ.FKG4.EKLG.  COMMON/TAB1/VG3.VL3.VG4.VL4.EFS3.EFS4  COMMON/TAB1/VG3.VL3.VG4.VG4.VL4.EFS3.EFS4  COMMON/TAB1/VG3.VL3.VG4.VG4.VL4.EFS3.EFS4  COMMON/TAB1/VG3.VL3.VG4.VG4.VL4.EFS3.EFS4  COMMON/TAB1/VG3.VL3.VG4.VG4.VG4.VG4.VG4.VG4.VG4.VG4.VG4.VG4		NOMMON	N/TABZ/KK].FKZ-KH[I.VII.VDER	•	24740	
COMMON/TABL/PSW1-PSTRAV.MOD1.WACK.MOD4 COMMON/TABL/SC3.C4.RMD13.RW1.MD4.RM1.RM3.RW4.RW1IM.RM1 COMMON/TABL/SC3.C4.RMD13.RW1.24.RM13.RW4.RW1IM.RW1IM.RD4.COMMON/TABL/SC3.C4.RMD13.RW1.PD1.V3.RM1.PD1.V3.RM1.RM1.RM3.RW4.RW1IM.PDC.COMMON/TABL/PSR1.PD1.SC3.RC4.FECS.RM2.RC1.BT.COMMON/TAB1.PD1.MS.RS.CP.CV.TEW3.TEWP.HL1.HL3.HL4.H3.H4 COMMON/TAB1.ZMS.RS.CP.CV.TEW3.TEWP.HL1.HL3.HL4.H3.H4 COMMON/TAB1.ZMS.RM2.NVENT.AVIN.AVMX.AK.ACS COMMON/TAB1.ZMS.RM2.NVENT.AVIN.AVMX.AK.ACS COMMON/TAB1.ZMS.RM2.NRG4.RML4.FEGS.RM4.RL4.EKL4 COMMON/TAB1.ZMS.RM2.NRG4.RML4.FEGS.RES.RM2.RMC4.RML4 COMMON/TAB1.SCC1.CL3.CG3.CC4.CG4.RMG3.RML3.RMG4.RML4.COMMON/TAB1.SCC1.CL3.CG3.CL4.CG4.RMG3.RML3.RMG4.RML4.FEGS.RES.CMCG.RMCA.RML4.CG3.VL3.VG4.VL4.EPS.S.EPS.CGMMON/TAB1.SCC1.CL3.CG3.CL4.CG4.RMG3.RM1.3.RMG4.RML4.TO.PMG4.RM.CG.CGCMGON/TAB1.SCC1.RES.CGC.CG4.RMG3.RM1.3.RMG4.RML4.FEGS.RM3.T.1.GC1.CGMGON/TAB1.SCC1.RMS.TCT.CG.CG3.CGC.CGC.CGC.CGC.CGC.CGC.CGC.CGC.		COMMON	NITERSIOC.AVENT.Al.Al.A.A.AHOLF.VCOR	•	24750	
COMMONATABS/C3.4.8RM313.8RM34.8RM34.8RM3.8RM4.8RM3.8RM4.8RM5/UR-PR-COMMONATABS/C3.4.8RM3.8RM3.8RM3.8RM4.8PM3.8RM4.8PM3.RM4.8PM3.RM4.8PM3.RM4.8PM3.RM4.8PM3.RM4.8PM3.RM4.8PM3.RM4.8PM3.RM4.RM2.COMMONATABS/PS.8PM3.RM5.REPS.EKPJ.FKG4.FSUM.EINT COMMONATABSIO.RB1.8G8.CP.CV.7FEW3.RM.A.ACS COMMONATABSIO.RB1.8G8.CP.CV.7FEW3.RM.A.ACS COMMONATABSIO.RB1.8G8.RS.CP.CV.7FEW3.RM.A.ACS COMMONATABSIO.RB1.8CB7.RS.8PM3.RM3.RM13.RMC4.RML4 COMMONATABSIO.RB1.8CB7.RS.8PM3.RM3.RM3.RM13.RMC4.RML4 COMMONATABSIO.RB1.8CB7.RS.8PM3.RM13.RMC4.RML4 COMMONATABSIO.RB1.8CB7.RS.8PM3.RM13.RMC4.RML4 COMMONATABSIO.RS.RS.RS.RFM4.RS.RS.RS.RS.RS.RS.RS.RS.RS.RS.RS.RS.RS.		101100	A CONTRACTOR TO STATE OF THE ST		24.75.0	
COMMON/TARS/C3-C4-RMII 3.RM134.RM034.RM03.RM1.RM3.RM4.RM3.RM4.PM COMMON/TARS/C13-C4-RMII 3.RM134.RM03.RM1.RM3.RM4.RM3.RM4.PM COMMON/TARS/C12-C3-C4-RM1.PI.V3.RM4.EINT COMMON/TARS/C12-C3-C4-EKP3.FK94.FK64.ESUM.EINT COMMON/TARSIL.RG3-E64-EKP3.FK94.FK64.ESUM.EINT COMMON/TARSIL.RG3-E64-EKP3.FK94.HL1.HL3.HL4.H3.H4 COMMON/TARSIL.RG3-C4-EKP3.FK94.RM4.H13.RM6.RML4 COMMON/TARSIL.RG3.C4-C64.RM4.RM3.RM13.RM64.RML4 COMMON/TARSIL.RG3.C4-C64.RM4.FL3.RM64.RML4 COMMON/TARSIL.RG3.C4-C64.RM4.RM3.RM4 COMMON/TARSIL.RG3.C4-C64.RM4.RM3.RM4 COMMON/TARSIL.RG3.C4-C64.RM4.RM3.RM4 COMMON/TARSIL.RG3.C4-C64.RM4.RM3.RM4 COMMON/TARSIL.RG3.C4-C64.RM4.RM3.RM4 COMMON/TARSIL.RG3.C4-C64.RM4.RM2.RM4 COMMON/TARSIL.RG3.C4-C64.RM4.RM2.RM3.RM3.I.0.E2/ CATA ISTEPJ/22/.KFC/-3/.KFH/-7/.MMXCOR/3/ CATA ADDON/I.0.E-C/.RTA/I/1.0.E0/.FTARS/I.3.F0/ DATA OVE/I.0.C0/.DELRC/N.3.E0/.EHQ/N.0.E0/ ETAWRFO.2EO/.PTS/N.5EO/.THRESH/I.3.F0/ DATA OVE/I.0.C0/.PTS/N.5EO/.THRESH/I.3.F0/ DATA OVE/I.0.C0/.PTS/N.5EO/.THRESH/I.3.F0/ DATA OVE/I.0.C0/.PTS/N.5EO/.THRESH/I.3.F0/ CATOLD = T F (JSTART .NE. 0) GO TO 200 FF (JSTART .NE. 0) GO TO 200	0.0	E CELCO	+0000000000000000000000000000000000000			
COMMON/TAR6/V1, VPS, SPS, RH1, PI, V9, RH3, P 3, V4, VP J, SPJ, APJ, RH4, P4 COMMON/TAR9/PSRS, PJR5, RF, PR, DC34 COMMON/TAR9/PSRS, PJR5, RF, PR, DC34 COMMON/TAR10/RH1, MG, RS, CP, CV, TE WP3, TE WP4, ML1, ML3, ML4, H3, H4 COMMON/TAR12/RWENT, NVENT, AVMIN, AVMAX, AK, ACS COMMON/TAR12/RWENT, NVENT, AVMIN, AVMAX, AK, ACS COMMON/TAR12/RWENT, NVENT, AVMIN, AVMAX, AK, ACS COMMON/TAR15/RM1, AVMIN, AVMIN, AVMAX, AK, ACS COMMON/TAR15/RM1, AVMIN, AVMIN, AVMAX, AK, ACS COMMON/TAR16/RM1, AVMIN, AVMIN, AVMAX, AK, ACS COMMON/TAR16/RM1, AVMIN, AVMIN, AVMAX, AK, ACS COMMON/TAR16/RM2, VL3, CG3, CL4, CG4, RMG3, RML4, RML4 COMMON/TAR16/RM2, VL3, CG4, RMG4, RML4 COMMON/TAR16/RM2, VL3, CG4, RM2, RM2, RM2, RM2, RM2, RM2, RM2, RM2		COMMON	N/TARS/C3.C4.RMD13.RMN34.RMO3.PMO4.RM1.RM3.RM4.RMSU		24770	
COMMON/TAB?/PDNT.TRAVEL COMMON/TAB?/PDNT.TRAVEL COMMON/TAB?/PDRS.PL.PR-DC34 COMMON/TAB?/PLPS.PEL-PR-DC34 COMMON/TAB?/PLPS.PEL-PR-DC34 COMMON/TAB?/PLPAGE.TMS.FMAX(10) COMMON/TAB?/PLPAGE.TMS.FMAX(10) COMMON/TAB?/PLPAGE.TMS.PMAX(10) COMMON/TAB?/PLPAGE.TMS.PMAX(10) COMMON/TAB?/PLPAGE.TMS.PMG4.PML4.E13.EL4.EKL4 COMMON/TAB?/PLPAGE.TMS.PMG4.PML4.E13.EL4.EKL4 COMMON/TAB?/PLPAGE.TMS.PMG4.PML4.E13.EL4.EKL4 COMMON/TAB?/PLPAGE.TMS.PMG4.PML3.PMG4.RML4 COMMON/TAB?/PS/SIGHA.U13.WE COMMON/TAB.U13.WE COMMON/TAB.U13.WE		COMMON	N/TAR6/V1, VDS, CPS, OH1, D1, V3, OH3, D1, V4, V6, VP.1, CP.1, AP.1, P		24780	
COMMON/TABILY BISSPEL, DR. C. C. COMMON/TABILY BISSPEL, DR. C.					400	
COMMON/TABB/PSRS.PL9Rs.0234  COMMON/TABB/PSRS.PL9Rs.0234  COMMON/TABBIA/KBIAGS.EKPS.EKPJ.FKG4.ESUM.EINT  COMMON/TABBIA/KBIAGS.ECA.EKPS.EKPJ.FKG4.ESUM.EINT  COMMON/TABBIA/KBIACHIAGS.TMS.PMAX.AX.ACS  COMMON/TABBIA/FBARNABR.9DR  COMMON/TABBIA/FBARNABR  COMM		ZOM LOS	NOTED TO THE PERSON OF THE PER	•	0	
COMMON/TAB9/EL1,EG3.EG4.EKPJ.FKG4.ESUM.EINT COMMON/TAB12/HI,MG.RS.CP.CV.FEMP3.TEV44.ML1.ML3.ML4.H3.H4 COMMON/TAB12/HVENT.NVENT.AFMAX.NAK.ACS COMMON/TAB12/HVENT.NVENT.AVMIN.AVMAX.AK.ACS COMMON/TAB12/HVENT.NVENT.AVMIN.AVMAX.AK.ACS COMMON/TAB12/HVENT.NVENT.AVMIN.AVMAX.AK.ACS COMMON/TAB12/HVENT.NVENT.AVMIN.AVMAX.AK.ACS COMMON/TAB13/FLL3.CG3.CL4.CG4.RMG3.PML4.EL3.EL4.EKL4 COMMON/TAB15/CL1.G.G3.RHL3.FHG4.RHL4.EL3.EL4.EKL4 COMMON/TAB15/CL1.G.G3.VL3.VG4.VL4.EPS3.EPS4 COMMON/TAB16/PNCA.3VG4.VL4.EPS3.EPS4 COMMON/TAB19/S1GMA.PL3.NFH/-7/.MAXCOP/3/ COMMON/TAB19/S1GMA.PL3.NFH/-7/.MAXCOP/3/ COMMON/TAB19/S1GMA.PL3.NFH/-7/.MAXCOP/3/ CDATA ADDON/1.0E-6/.BIAS1/2.SE1/.BIAS2/1.AF0/. 2ETAMYF/O.ZEO/.ETAMX1/1.0E4/.ETAMX2/1.AF0/ OATA ONE/1.0E0/.PT5/0.3E0/.ZEH0/0.0E0/ KRLG = 0 TOLD = T FLOTN=FLOAT(N) IF (JSTAPT .GT 0) 60 TO 200 IF (JSTAPT .NE. 0) 60 TO 200		ZOMMOD	N/TA89/PSRS+PJRS+PL+PR+OC34	•	24800	
COMMON/TABIO/RII.WG.RS.CP.CV.TEWD3.TEWD4.HLI.HL3.HL4.H3.H4  COMMON/TABIJ/LSK IP.LPAGE.TMS.RNAX:10)  COMMON/TABIJZ/HVENT.NVENT.AVMIN.AVMAX.AK.ACS  COMMON/TABIJZ/HVENT.NVENT.AVMIN.AVMAX.AK.ACS  COMMON/TABIJZ/HVENT.NVENT.AVMIN.AVMAX.AK.ACS  COMMON/TABIJZ/HVENT.NVENT.AVMIN.AVMAX.AK.ACS  COMMON/TABIJZ/HVENT.AVGA.CG3.CL4.CG4.RMG3.RML3.RMC4.RML4  COMMON/TABIJZ/HVG3.NL3.VG4.VL4.EPS3.EPS4  COMMON/TABIJZ/HVG3.NL3.VG4.VL4.EPS3.LSC.ML4.ETAFCH.NC1.0)  COMMON/TABIJZ/HVG3.NL3.VG4.VL4.EPS3.EPS4  COMMON/TABIJZ/HVG3.NL3.VG4.VL4.EPS3.LSC.ML3.RNL4.NL4.ID.N.PMC1.0)  COMMON/TABIJZ/HVG3.NL3.VG4.VL4.EPS3.EPS4  COMMON/TABIJZ/HVG3.NL3.VG4.VL4.EPS3.EPS4  COMMON/TABIJZ/HVG3.NL3.VG4.VL4.EPS3.EPS4  COMMON/TABIJZ/HVG3.NL3.VG4.VL4.EPS3.EPS4  COMMON/TABIJZ/HVG3.NL3.VG4.VL4.EPS3.EPS4  COMMON/TABIJZ/HVG3.NL3.VG4.VL3.VG4.VL4.EPS3.EPS4  COMMON/TABIJZ/HVG3.NL3.VG4.VL3.VG4.VL4.EPS3.EPS4  COMMON/TABIJZ/HVG3.NL3.VG4.VL3.VG4.VL4.TG7.NL4.T	-	COMMON	N/TARG/ELL.FGG.EG4.FKPS.FKPL.FKG4.FKGM.FLNT	-	24810	
COMMON/TABLIZENTH # # # # # # # # # # # # # # # # # # #	•		THE RESERVE TO SELECT THE PROPERTY OF THE PROP		34030	
COMMON/TABIL/LSK IP-LPAGE, TMS, RWAX(10)  COMMON/TABILZ/MVENT, NVENT, AVMIN, AVMAX, AK, ACS  COMMON/TABILZ/MVENT, NVENT, AVMIN, AVMAX, AK, ACS  COMMON/TABILZ/MVENT, NVENT, AVMIN, AVMAX, AK, ACS  COMMON/TABILZ/MVENGS, RML, 3, RMC4, RML4, ELS, EL4, EKL4  COMMON/TABILZ/MVG3, VL3, VG4, VL4, EFS 53, EFS4  COMMON/TABILZ/MVG3, VL3, VG4, VL4, EFS 53, EFS4  COMMON/TABILZ/MG4, VL3, VG4, VL4, EFS 53, EFS4  COMMON/TABILZ/MG4, VL3, VG4, VL4, EFS 53, EFS4  COMMON/TABILZ/MG4, VL3, VG4, VL4, EFS 52, EL7, BML4 (10), PMD4 (10), PMD4 (10)  COMMON/TABILZ/MG4, VL3, VG4, VL3, VG4, VG7, VG4, VG7, VG7, VG7, VG7, VG7, VG7, VG7, VG7		COMMON	N/IAMIO/RU·WG·MS·CP·CV·FEMP3·TEMP3·TEMP3·H		02442	
COMMON/TABL2/MVENT.NVENT.AVMIN.AVMAX.AK.ACS  COMMON/TABL3/PI  COMMON/TABL3/PI  COMMON/TABL3/DDR.PDR.RDR  COMMON/TABL3/DDR.PDR.RDR  COMMON/TABL3/CL13.CG3.CL4.CG4.RMG3.RML3.RMG4.RML4  COMMON/TABL3/CL13.VG4.VL4.EPS3.EPS4  COMMON/TABL3/D1NC.PDR.RDR.RDR.RDR.RDR.101.PMD3(10).PML4(10).PMD4(10)  COMMON/TABL3/D1NC.PDR.RDR.RDR.RDR.RDR.3/L01.PMD4(10)  COMMON/TABL3/D1NC.PDR.RDR.RDR.RDR.3/L01.PMD4(10)  COMMON/TABL3/D1NC.PDR.RDR.RDR.RDR.3/L01.PMD4(10)  COMMON/TABL3/D1NC.PDR.RDR.RDR.RDR.RDR.RDR.RDR.RDR.RDR.RDR		COFFOR	N/TAB11/LSKIP。LPAGE。TMS。AMA×10)	•	24930	
COMMON/TABLE/DP.ADR.NDR.CA.CGA.RMG3.RML3.RMC4.RMLA COMMON/TABLS/CLI.CLI.CLI.CGA.RMG3.RML3.RMC4.RMLA COMMON/TABLS/CLI.CLI.CLI.CLI.S.CG3.CLA.CGA.RMG3.RML3.RMC4.RMLA COMMON/TABLS/CA.VLA.EPS3.EPS4 COMMON/TABLS/DINC.PODR(10).PML3(10).PMD3(10).PML4(10).PMD4(10) COMMON/TABLS/DINC.PODR(10).PML3(10).PMD3(10).PML4(10).PMD4(10) COMMON/TABLS/DINC.PODR(10).PML3(10).PMD3(10).PML4(10).PMD4(10) COMMON/TABLS/DINC.POR(10).PML3(10).PMC3/1.RE2/- ICRDNWN/O.IEO/.DELRC/O.3EG/.ETACF/O.25EG/.ETAMIN/O.IEO/- ZETAMYF/O.2EG/.ETAMIN/O.EO/.THRESH/I.3FO/ DATA OWNEXI.RED/.PS/O.3EG/.ETAMIN/O.1EO/- TOLD = T FLUTN=FLOAT(N) IF (JSTART GT. 0) GO TO 200 IF (JSTART NE. 0) GO TO 200 IF (JSTART NE. 0) GO TO 150  CC		20270	A TALES OF THE PARTY AND THE PARTY OF THE PA	•	24940	
COMMON/TABLA/DPR-ADR-BDR COMMON/TABLA/DDR-ADR-BDR COMMON/TABLA/DDR-ADR-BDR COMMON/TABLA/DDR-ADR-RDR COMMON/TABLA/DDR-ADR-RDR COMMON/TABLS/CL[3·C[3·C[4·C[4·C[4·C[4·E]K]L4-E]K]L4-E]K] COMMON/TABLS/CL[3·C[3·C[4·C[4·C]A]K]C] COMMON/TABLS/CL[3·C[4·C[4·C]A]K]C] COMMON/TABLS/CL[3·C[4·C]A]K]C] COMMON/TABLS/CL[3·C[4·C]A]K]C] COMMON/TABLS/CL[3·C[4·C]A]K]C] COMMON/TABLS/CL[3·C[4·C]A]C]C CDATA ADDON/1.0E-6/.BIASI/2.5E]C, RIASZ/2.5E[1/8]AS3/1.0E2/. ICROMN/0.1E0/.DELAK/C.3E0/.ETAKZ/1.0F[1/6TAMX]C].FCO/.  ZETAMYF/O.2E0/.ETAMXI/1.0E4/.ETAMXZ/1.0F[1/6TAMX]C].FCO/.  ACTA ONE/1.0E(0/.PTS/0.3E0/.ZEHO/O.0E0/ KRLG = 0 TOLD = T F(JSTAPT .GT 0) 60 TO 200 IF (JSTAPT .GT 0) 60 TO 200 IF (JSTAPT .NE. 0) 60 TO 150		ZOE ESS	NOTE OF THE PROPERTY OF THE PR	•	2	
COMMON/TAB16/FMG9.ADR.ADR.ADR.ADR.ADR.ADR.ADR.ACGA.RMG3.RMC4.RMLA COMMON/TAB15/CL1.CL3.CG3.CL4.CG4.RMG3.RML3.RMC4.RMLA COMMON/TAB16/FMG3.RML3.RMC4.RML4.EL3.EL4.EKL4. COMMON/TAB16/FWG3.RML3.RMC4.RL3.EDS4 COMMON/TAB16/FWG3.VL3.VG4.VL4.EPS3.EPS4 COMMON/TAB16/FWG7.UL3.VG4.VL4.EPS3.EPS4 COMMON/TAB16/FWG7.UL3.VG4.VL3.VG7.BML4(10).PMD4(10) COMMON/TAB16/FWG4.UL3.WE DATA ADDON/1.0E-6/.BTA51/FY.RMTACO.FETANTHYO.1E0/. ICRDNWN/O.1E0/.DELAC/O.3EG/.ETACF/O.25E0/.ETANTHYO.1E0/. 2ETANYFYO.2EG/.ETACF/O.25E0/.ETACF/O.25E0/.ETANTHYO.1E0/. BATA OWNE/1.0E0/.PT5/O.3EG/.ETACF/O.3E0/. FRLAG = 0 TOLD = T FLUTN=FLOAT(N) IF (JSTART AGE O) 60 TO 200 IF (JSTART NE. 0) 60 TO 200 IF (JSTART NE. 0) 60 TO 150		COLLON	N/TAB13/PI	•	24850	
COMMON/TABIS/CLI.CL3.CG3.CL4.CG4.RMG3.RML3.RMC4.RML4 COMMON/TABIS/CLI.CL3.CG3.CL4.CG4.RMG3.RML3.RMC4.RML4 COMMON/TABIS/CLI.CG3.CL4.CG4.RMG3.RPLC4.EK4.EKL4 COMMON/TABIS/CLI.C.FODR(10).PML3(10).PML4(10).PML4(10).COMMON/TABIS/SIGNCA.UI3.WE  DATA ISTEPJ/20/.KFC/-3/.KFH/-T/.MAXCOP/3/ C DATA ISTEPJ/20/.KFC/-3/.KFH/-T/.MAXCOP/3/ ICROMN/0.1E0/.DELMC/0.3E0/.ETACF/0.2E0/.ETAMIN/0.1E0/.  ZETAWYF/0.2E0/.ETAMX/1.0E4/.ETAMX2/1.0E1/.ETAMX3/1.5E0/. 30NESSW1.00001E0/.SHORT/0.1E0/.THRESW1.3E0/ DATA ONE/1.0E0/.PTS/0.5E0/.ZEH0/0.0E0/ KFLAG = 0  TOLD = T  FLOTWEFLATIN GT 0) 60 TO 200 IF (JSTAPT .GT 0) 60 TO 200 IF (JSTAPT .NE. 0) 60 TO 150	40	NOMMON	N/TA814/DD-408-808	•	24860	
COMMON/TABLO/SHL9/RHG3.NHL9.RHL6.RHL4.EL3.EL4.EKL4 COMMON/TABLO/SHL9.RHL6.RHL4.EL3.EL4.EKL4 COMMON/TABL9/S1.RHL3.RHL6.RHL4.EL3.EL4.EKL4 COMMON/TABL9/S1.GHA.U13.WE COM				•	01010	
COMMON/TABLE/PHG3.RPHG4.RHL4.EL3.EL4.EKL4.COMMON/TABLE/PHG4.RHL4.EL3.EL4.EKL4.COMMON/TABLE/PVG4.VL4.EPS3.EPS4.COMMON/TABLE/VOG3.VL3.VG4.VL4.EPS3.EPS4.COMMON/TABLE/VOG3.VL3.VG4.VL4.EPS3.EPS4.COMMON/TABLE/VOMON/TABLE/POMON/T		COMMON	N/18815/CL1.cL3.cL3.cL4.cG4.RMG3.RML3.RMG4.RML4	-	2747	
COMMON/TABIL/VG3.VL3.VG4.VL4.EPS3.EPS4  COMMON/TABILSOINC.PDDR(10).PML3(10).PMD3(10).PML4(10).PMD4(10)  COMMON/TABILSOINC.PDDR(10).PML3(10).PMD3(10).PML4(10).PMD4(10)  COMMON/TABILSOINC.PLARALI3.ME  DATA ISTEPJ/20.*KF4/-7.*MAXCOP/3/  C		COMMON	N/TAR16/PHG3.RHL3.RHG4.RHL4.FL3.EL4.EKL4	•	24880	
COMMON/TABIB/DINC.PDDR(10).PML3(10).PML3(10).PML4(10).PMD4(10) COMMON/TABIB/SIGMA.UI3.WE  DATA ISTEPJ/20/*KFC/-3/*KFH/-7/*MAXCOP/3/ C  DATA ADDON/1.0E-6/.BIAS1/2.SE1/.BIAS2/2.5E1/.BIAS3/1.nE2/. ICRDOWN/0.1E0/.DELMC/0.3E0/.ETAMY2/1.nE2/. 30NEPSH/1.00001E0/.SHURT/1.0E4/.ETAMY2/1.nE0/. DATA ONE/1.00001E0/.SHURT/0.1E0/.THRESH/1.3E0/ DATA ONE/1.0E0/.PT5/0.5E0/.ZEH0/0.0E0/ KFLAG = 0  TOLD = T  FLOTN=FLOAT(N) IF (JSTAPT .6T 0) 60 TO 200 IF (JSTAPT .NE. 0) 30 TO 150		NOMEDI	NITABLI 7 / VG3 . V. 3 . VG4 . V. 4 . FOC3 . FOCA	•	24800	
COMMON/TABLES/OTNU-REPLACION-PRICE/OTNU-REPLACION-PRICE/OTNU-REPLACION-REPLACION-PRICE/OTNU-REPLACION-REPL					0 0 0 0 0	
COMMON/TAB19/SIGMA,U13,WE  DATA ISTEPJ/20/*KFC/-3/*KFH/-7/*MAXCOP/3/  C		E OH EOJ	N. 18013/01/NC+1004(10)+1-1/3(10)+1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1-1/3(10)+1/3(10)+1-1/3(10)+1/3(		201	
DATA ISTEPJ/20,*KFC/-3/*KFH/-T/*MAXCOP/3/  C DATA ADDON/1.0E-6/*BIAS1/2.5E1/*BIAS3/1.nE2/*  ICROMN/0.1E0/*DELRC/0.3E0/*ETACF/0.25E0/*ETAMTH/0.1E0/*  ZETAMYF/0.2E0/*ETAMXI/1.0E4/*ETAMX2/1.0F1/*ETAMX3/1.5E0/*  JONEPSM/1.00001E0/*SMORT/0.1E0/*THRESH/1.3F0/  DATA ONE/1.0E0/*PT5/0.5E0/*ZEH0/0.0E0/  KRLAG = 0  TOLD = T  FLOTWEFLOAT(N)  IF (JSTAPT *6T 0) 60 TO 200  IF (JSTAPT *NE 0) 60 TO 160  TOLD = T  FLOTMETONE *CONTINE 0) 60 TO 160  TOLD = T  FLOTMETONE 0  TOLD = T  FL		NOMICO	N/TAB19/SIGHA.U13.WE	0	24910	
C DATA ADDON/1.0E-6/.8IAS1/2.5E1/.8IAS2/2.5E1/.8IAS3/1.0E2/. ICROMWN/0.1E0/.6DLRC/0.3E0/.ETACF/0.2E6/.ETAMYN/0.1E0/. ZETAMYF/O.2E0/.ETAMYI/1.0E4/.ETAMX2/1.0E1/.ETAMX3/1.5E0/. 30NEPSW/1.00001E0/.SHURT/0.1E0/.THRESH/1.3E0/ DATA OWE/1.0E0/.PT5/0.5E0/.ZEHO/0.0E0/. KFLAG = 0 TOLO = T FLOTN=FLOAT(N) IF (JSTAPT .6T 0) 60 TO 200 IF (JSTAPT .6T 0) 60 TO 150		1 4140	100000 1000 1000 1000 1000 1000 1000 1	•	24020	
C DATA ADDON/1.0E-6/.BIAS1/2.5E1/.BIAS2/2.5E1/.BIAS3/1.nE2/.  ICROMN/0.1E0/.DELMC/0.3E0/.ETACF/0.25E0/.ETANTN/0.1E0/.  ZETAMYF/0.2E0/.ETAMX1/1.0E4/.ETAMX2/1.0F1/.ETAMX3/1.5E0/.  30NESM/1.00001E0/.SMORT/0.1E0/.THRESM/1.3F0/  DATA OME/1.nE0/.PT5/0.5E0/.ZEM0/0.0E0/  KRLAG = 0  TOLD = T  FLOTWEFLAT(N)  IF (JSTAPT .GT 0) 60 TO 200  IF (JSTAPT .NE. 0) 60 TO 150		4 40	Later de la company de la comp	- 1	200	
DATA ADDON/1.0E-6/.8IAS1/2.5E1/.8IAS2/2.5E1/.8IAS3/1.nE2/.  ICROMN/0.1E0/.0ELRC/0.3E0/.ETACF/0.5E0/.ETANYN/0.1E0/.  ZETAMYF/0.2E0/.ETAMY1/1.0E4/.ETAMX2/1.5E0/.  30NEDSM/1.00001E0/.SHORT/0.1E0/.THRESH/1.3F0/  DATA OME/1.0E0/.PT5/0.5E0/.ZEH0/0.0E0/  KFLAG = 0  TOLD = T  FLOTN=FLAT (N)  IF (JSTAPT .6T 0) 60 TO 200  IF (JSTAPT .ME. 0) 50 TO 150	U			E	06692	
1CRODWN/0.1E0/.DELMC/0.3E0/.ETACF/0.25E0/.ETAMTH/0.1E0/. 2ETAMYF/0.2E0/.ETAMXI/1.0E4/.ETAMX2/1.0E1/.ETAMX3/1.5E0/. 3ONEPSW/1.00001E0/.SHURT/0.1E0/.THRESH/1.3E0/ DATA ONE/1.0E0/.PT5/0.5E0/.ZEH0/0.0E0/ KFLAG = 0 TOLD = T FLOTWEFLAT(N) IF (JSTAPT .GT. 0) 60 TO 200 IF (JSTAPT .NE. 0) 60 TO 160		DATA AL	ADDON/1.0F-6/-81451/2.5F1/.81452/2.5F1/.81453/1.0F2	•	24960	
ZETATORNY 1. 12. 12. 12. 12. 12. 12. 12. 12. 12.			TO COMPANY OF THE PROPERTY OF		24050	
ZETAPYT/0.2E0/.ETAMX3/1.5E0/.  30NEPSM/1.00001E0/.SHURT/0.1E0/.THRESH/1.3F0/  DATA OME/1.0E0/.PT5/0.5E0/.ZEH0/0.0E0/  KFLAG = 0  TOLO = T  FLOTN=FLOAT(N)  IF (JSTAPT .6T 0) 60 TO 200  IF (JSTAPT .ME. 0) 30 TO 150		T C M C M C C M C C M C C M C C M C C M C C M C C M C C M C C M C C M C	N. O. E. C. V. C.	= (	1111	
30MEPSW/1,00001E0/.SHURT/0,1E0/.THRESH/1,350/ DATA OWNE/1,0E0/.PT5/0,5E0/.ZEHO/0,0E0/ KRLAG = 0 TOLD = T FLOTW=FLOAT(N) TF (JSTART .GT. 0) 60 TO 200 TF (JSTART .NE. 0) 60 TO 150	es.	ZETAMYF,	F/O.ZEO/.EIAMXI/1.0E4/.EIAMXZ/1.0FI/.EIAMX3/1.5EO/.	•		
DATA ONE/1. DEO/.PTS/O.SEO/.ZEHO/O.0EO/ KFLAG = 0     TOLD = T FLOTN=FLOAT(N)     IF (JSTAPT 6T 0) 60 TO 200     IF (JSTAPT NE. 0) 60 TO 150		JONE DOM	1/1 .00001F0/.SHOR1/0.1F0/.THBFSH/1.3F0/	•	24970	
KELAG = 0  TOLD = T  FLOTN=FLAT(N)  IF (USTAPT AGT 0) 60 TO 200  IF (USTAPT NE. 0) 60 TO 150		AT AC	CAME / 1 OF D. DIS. / D. SED / JEDD / D. DED /	•	24080	
TOLD = 0 FLOATWEFLAAT(N) FLOATART 67. 0) 60 TO 200 IF (JSTART NE. 0) 60 TO 150				• "		
FORWERFERNAT(N)  IF (JSTART 67. 0) 60 TO 200  IF (JSTART NE. 0) 60 TO 150		KPLAG	Б	=	255	
FLOTN=FLOAT(N)    F (JSTAPT .6T. 0) 60 TO 200    F (JSTAPT .NE. 0) 90 TO 150		10,0		•	25000	
F (JSTAPT .6T. 0) 60 TO 200	-	FLOTNE	=F[OBT(2)	-	25010	
0) 00 40 40 40 40 40 40 40 40 40 40 40 40		101		_	25020	
				: «	00000	
natestannon not not a second and account to the second of	•					
	٥					
•	Ü	AN THE FIRS	C ON THE FIRST CALL. THE OWNER IS SET TO 1 AND THE INITIAL		25050	

general manager of the contract of the contrac

SUGANUTINE TSTEP	76/76	OPT=1 HOUND=+++/ TUACE	FTN 4.8.501	37/25/45	13.15.4
115		ATED. ETAMAK IS THF MAI	IS THE MAXIMIM RATIO NY	. 050520	
		WHICH M CAN RE INCREASED IN A SINGLE STEP. IT IS 1.EN. FOR THE	T IS 1.ENA FOR THE	070320	
	C FIRST STEP TO COMPENSA	TE FOR THE SMALL INITIAL	TO A THE STATE OF	022040	
		THEN 1.5 THERE AFTERS	I' A TAILUME	00000	
;		ATT THE STATE OF THE PROPERTY		025110	
150		CINAL A CARD.	DIA NOTICE LOUIS	025120	
				025130	
	CALL DIFFIN (N.T. Y. SAVE)	CAVE 11		025140	
	No. 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			925150	
126	110 VIT S HOSAVEILE			025160	
	HETH H FF			025170	
	HILES H FF - 10 CAPTA	¥.		025190	
	MITER B MITER + 1			055190	
	MFOLD # MF			05220	
130	I H OZ			052210	
1	L = 2			025220	
	TAUCED # H			025230	
	PRL1 = ONE			025240	
	PC = 25P0			025520	
1.15	FTAMAX = ETAMX			025260	
66.	ACITICAL NO.			025270	
				025240	
				025290	
	O # COLLEG			000000	
	NFE = 1			005 200	
042	0 H W72			025310	
:	TPR111 - 00005			025320	•
	GO TO 200			025330	
			***************************************	025340	
	SONAU SAN GRAN THE T	O M. THEN Y MICT DE DESC	CALFD. TE THE	025350	
•	C IT THE USER THE CARROLL THE THE COLT TO MITTER TO STORY	THEN NEED TO CET TO M	TTEO TO ENOUE	025360	
•	C (13gr Fras Cranded Fight	THE ACT OF THE ACT OF THE ACT	TANK DETAIL	026370	
	C THE PARTIAL DERIVATIVEES TO BE UPDATED. IT THE SELVE USTO	ES TO BE UPDATED. IF THE	TAME BEING USTUA	075570	
	!			00000	
	150 IF (MF .EQ. MFOLD) GO TO 170	60 TO 170		045.00	
	MALIE OIL			004000	
159	METH # MF/10			01100	
	MITER A MF - ICOMPIN	ž		00000	
	AM IN COLOMB			01.000	
	IF (MITER SEG. MIO)	1 GO TO 170		04000	
				00400	
155	FITER B MITER + 1				
	170 IF (H .EQ. MOLD) G	0.10 200		94480	
				004500	
	T T HOLD			02550	
	14E00 # 3			025510	
140	GO (O 183)			075570	
		CALENTAL OF THE CALE		025520	
	INS EIRHANINI (FIR-HERK)	/ADS (H) of (BIAX)		02556	
	*I = UNC			02550	
,				0755	
145	2 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -			025570	
				025540	
		•		025590	
				025500	
		D24 CT CE		07550	
11.11			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	025420	

MULTIPLE OF THE PROPERTY OF TH

Calip	SIPPOUTTNE TSTEP	74/76	1=1	÷00	, 4 - 4 = Ci	OPT=1 POURD=+-+/ TRACE	7	FTV 4.8.601	•	02/22/HS	13.15.4
			i	į				:		;	
	CTHISS	ECTION COM	PUTES T		PFOTCTE	SECTION COMPUTES THE PAPOICIES (ALUES MY EFFECTIVELY	LFFFCTIV	در د		025630	
		LYING THE	Y AHRAY	٠ ج	THE DAY	MULTIPLYING THE V ANNAY SY THE PASCAL TRIANGLE MATRIX. THEN	XIGLEN .	241		052440	
		IS CALLED	TO ORTA!	₩ Z	. THE	COSET IS CALLED TO ORTAIN EL. THE VECTOR OF COEFFICIENTS OF	7EFF10164	TS 0F		025650	
175	C LENGTH	. CN	AC IS T	<u> </u>	ATIO OF	LENGTH NO . 1. RC IS THE RATIO OF NEW TO OLD VALUES OF THE	VALUES O	THF F		025660	
	CCOEFFI	CIENT H/EL	(2)	EN K	C DIFF	ERS FPOM 1	T BOOM YE	741		025670	
	C DELPC.	NFW. IS S	FT TO 4	TER	TO FOR	CE THE PART	AL DEPIV	ATIVES		025640	
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	HONATED. I	F LISED.	Ē	DC 18	TO BE INDIATED. IF INFO. DEPOT TO 3. IN ANY CARE, THE DADITAL	CASE	JE DARTTAL		025690	
	AVE 020	TANEC ADE	O TAGO		FACT	VEDV 20.TL	Tro			025700	
	CDENIVALI				L M D	אשנ כבושונים או ננאסו לילבו ביידום סוינים				00220	
										026730	
			9							007100	
	3	# 10 012 H								05/020	
		20 012 00	01.10 H	9						05220	
		0N) = 7		25						05150	
1.95		1 012 00	Z :	;	•					025760	
	210	(T•1) k	Y(I+C+I) # Y(I+C+I) + Y(I+C+I)	•		<b>-</b>				025770	
	<b>4</b> 0	CALL COSET	•	ļ	1					025790	
	Ž.	BND = FLOTN*(TO(4) *EPS) **2	(TO(4) •	EPS)	2*					025790	
	Ę.	RL1 = ONE/EL(2)	(2)							025800	
190	S.	RC = PC+(RL1/PPL1)	/PPL11							025A10	
	io d	PPL1 = ሚ1								025420	
	16	IF (NSTEP .GE. NSTEPJ+ISTEPJ)	E. NSTE	1100	STEPJ)	NEWS = MITER	~			0.55830	
	Š	DRC=ABS (RC-ONE)	NE)							025840	
	<u>.</u>	IF (PRC .LE. DELPC) GO TO 21	DELPC	9	FO 215					025850	
300	2	NF4.1 = MITER	; ;		;					025860	
	0	COATE = ONE								025870	
										088570	
										200000	
	9 :	10 620						,		040000	
	-	· MITEM	ME. 0)	, M	2	IF ([MITER .NE. 0] .AND. (DFC .NE. ZEHU)) CHATE	CHAIR # ON!	- NO		00520	
=										05030	
	01 4 5	3 COMMECTO	N I TERM	100	2 AMP	AKEN. A CU	NEW DENCE	1251 15	7 1 1 1	000000	
	NC O	ROOT MEAN	SOUAPE	Ž (	OF EA	C ON THE ROOT MEAN SQUARE NORM OF EACH CORRECTION. USING MID. WHICH	N. USING	HA GINE	X.	025930	
	C 15 0EP	ENDENT ON	FPS. TP	֝֞֞֜֜֝֓֞֜֝֟֝֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֡֓֜֜֝֟֓֓֓֓֓֓֡֓֜֝		HE COPRECTION	NS IS AC	CUMIJERTED	Z	04020	
	C THE VE	CTOM ENROR	THE .	2	7A7 15	C THE VECTOR ERROR. THE TANAT IS NOT ALTERED IN THE CORRECTOR	IN THE C	DERECTOR		05550	
202	ر ( ۱۵۵ <b>۳</b> و	THE UPDAT	ED Y VEC	20	15 510	HED TEMPORAL	S NI A N	4 V.E. 2 .		025950	
			į		,	}   66   6			•	07950	
	5	1441 = 1 0EZ 00								077440	
	230	EPROFILL # 2E-40	25.40							05650	
			;							000000	
										026030	
		AFF & AFF & 1		•	9					00000	
		(NEWS OFF	00 (0		1					024040	
	THE THINK	TOATED. TH	F WATOT	۵	1	THE MATORIA OF THE MATORIA OF THE PERSON OF	FVALUATE	BEFORE		026050	
215		NG THE COR	RECTOR	TEN	TION	CIADITAG THE CORRECTOR ITERATION. NEW IN SEL TO 0 AS AN	TO 0 AS	2		026050	
		TOP THAT T	HIS HAS	BFEN	DONE	INDICATOR THAT THIS HAS BEEN DONE. IF MITER # 1 08 2, P 15	1 08 2.	21.0		026070	
		ED AND PRO	CESSED 1	Z	ET. I	COMPUTED AND PROCESSED IN PSET. IF WITER # 30 THE MATRIX	THE MAT	SI XIS		026090	
		- H+91.1+0.	WHEPE	115	A DIAG	P = I - HOGLIOD, WHEPE D IS A DIAGONAL MATRIX.	PLI IS	•		056090	
		*****		-						056100	
220	NE	NEW) = 0								026110	
	0	a ONF								026120	

CALL PSFT (V-MO.CON-MITER. JER. NSO, YMAK, SAVEI. SAVEZ, CAVEJ.

SUMMOUTINE TSIEM	4.17			C0/22/20	1 3 1
	;				
	± ;	(   EM .NE. n) GO 10 420			
<b>53</b> 0				012020	
	֓֞֜֜֜֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֡֓֓֓֓֡֓֓֓֓֡֓				
	֡֟֟֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֟֓֓֓֓	107177   11070 DESTRUCTION   1070 DESTRUCTION   107		05050	
		THE CALL DESCRIPTION OF THE CALL OF THE CA		026250	
215	1 14 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			025260	
	4			025270	
	00	No 240 I # 10M		026290	
	Œ	RO = H-SAVE2(1) - Y(I+2)		056290	
,	<b>a</b> . 1			026300	
240	٠,	D # SHORTHRO - Me(SAVEI(I) - SAVEZ(I))		076420	
				0.000	
		IF(APS(RG).LT.[ROUND*YMAX(I)]GG TG 240		026330	
		THE PART OF THE PA		026350	
245	. •	74(T) # D2(T) + D0		026350	
	280			026370	
	9	60 TO 370		026380	
	290 60	(295•		056390	
_				058400	
750	IN THE	<b>-</b>	IS UPDATED DIRECTLY FROM	026410	
	THE RES	AST DIFFUN CALL.		05450	
				026430	
				026450	
265	2	0 - 01141466AVFO(1) - V(1,0))		026450	
7.7	. 6			026470	
		AAVF1(T) H < Tall → D		026480	
	300 E	•		056490	
	09	60 TO 400		026500	
260 0				026510	
	C IN THE	IN THE CASE OF A CHORD METHOD, THE RESIDUAL -G(Y SUB N(M))	18 N("))	026520	
	IS COMP	IS COMPUTED AND THE LINEAP SYSTEM WITH THAT AS RIGHT-HAND SIDE	IT-HAND SIDE	026530	
_	W d CNV		DECOMPOSITION	026540	
	C OF P IF	OR 2. IF MITER # 3 THE SCALAR	PLI IS HPDATED.	026550	
245				026550	
				0.000	
	16	IF (HRL) FO. PHRL) GO TO 330		026590	
	•			026500	
270	00	DO 320 I = 1.0		026610	
	0	D = ONE - R+(ONE - ONE/PW(I))		029920	
		IF(APS(D).EQ.ZERO)60 TO 440		026630	
	i	PW(I) = ONE/O		026640	
	330 00			025650	
275	,	SAVEI(I) = PW(I)+(RLI+H+SAVE2(I) - (PLI+Y(I+2)	:) • ERPOP([)))	026460	
		60 TO 370		026670	
•	6	00 340 I m I+N		026580	
r1	340 SAV	SAVEG(1) ##C  = MeSAVEC(1) = (#LleY(1.2) +FREQU(12)		000000	
	ָרָבְייִר בְּיִרְיִירְיִירְיִירְיִירְיִירְיִירְיִיר	CALL SOLVE MANIETTANTINASAVE SASAVE IS		0.000	
= 1		N=		076770	
		0000		026730	
	· C	D = 0 + (SAVF1(1)/YMAX(T))002		025740	
	340 5	SAVE1(1) = Y([+1) + EPPNR(1)		026750	
				025740	

C 12 TEST.	056790
(M.NE.O)CRATE=AMAXI (CROOWN+CRATE,O/DI)	026910
IF(DeAMIN](ONE,CRATE),LE,AND)GO TO 450	026420
	025840
000.00HND) 4=MAXCOD	026850
IF (F .F.O. MAXCOR) GO TO 410	026450
GO TO (295, 350, 350, 310), MITERI	026880
HE CORPECTOR TERATION FAILED TO CONVERGE IN 3 TRIES, IF PARTIAL	025900
DEPIVATIVES ARE INVOLVED BUT ARE NOT UP TO DATE, THEY ARE	016920
	026920
F POSSIRLE. IF NOT. A NO-CONVERGENCE EXIT IS TAKEN.	026940
CARTER AND AFT A MEN A MAXCON 4 1	025950
IF (NEW J.F.D1) GO TO 440	026970
	026980
	05550
DN-17 H 17 DF DO DO DN-17 H 27 DF DO DO DD	027010
27	021020
Z ****	027030
	027040
E.HMIN-ONEDSM160 10 580	027050
	027070
OFF	027090
TEB	057090
GO TO 220	027100
	021120
NO	027130
2	027140
C STATEMENT 500 IF IT PALCS.	027140
	021120
<b>3</b>	027180
N° 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	057 200
38(I)/YMAX(I))**2	027210
E # FLOTNe(T0(2) *EPS) *+2	N27220
AVE GOME TOO FAR.	027230
COT BACK THE TIME STEP.	027260
	02720
:	027270
X ARE	027290
THE VECTOR TAU CONTAINS THE NO + 1 MOST RECENT VALUES OF M. O.	027300
	011750
	, , , ,

300

340

335

ç

PAGE

02/22/P5 13.15.44

FTN 4.9.40]

OPT=1 HOUND=+-\*/ THACE

76/76

SUPPOUTINE TSTEP

290

295

315

320

375

330

SUPPOUTIVE TSTEP	VE TSTEP 74/76 OPT=1 ROUND=+-+/ TRACE FTN 4.44601	02/22/RS	13.1
ς.	C & CHANGE IN H OP NJ IS MADE ONLY OF THE INCREASE IN H C IS 97 & FACTOR OF AT LEAST 1.3. C IF NOT. NOINDX IS SET TO 2 TO PREVENT TESTING FOR THAT MANY C STEPS. IF NO IS CHANGEO. NOINDX IS SFT TO NO + 1 (NEW VALUE).	027340 027350 027350 027350	
350	MFLAG ≈ 0 IRED0 = 0 NSTEP = NSTEP + 1 HUSED = H	027390 027400 027410 027420	
355	DO 470 IRACK = 1.N3 I = L - IRACK 470	027440 027450 027460 027470	
940	DO 480 I = 1.N 480 Y(I.J) = Y(I.J) + ERROP(I)*EL(J) NOINDX = NOINDX - 1 IF (L. *EQ. LMAX) .OP. (NGINDX .NE. 1)) GO TO 495	02750 02750 02750 02751 027520	
365	490 Y(1.44) = ERROR(I) CONP = TO(S) 495 IF (ETAMAX .NE. ONE) GO TO 520 IF (NGINDX .LT. 2) NGINDX = 2 GO TO 690	027540 027540 027560 027570 027570	
37.0	C THE ERPOR TEST FAILED. KFLAG KEEPS TRACK OF WULTIPLE FAILURES. C T AND THE Y ARRAY ARE RESTORED TO THEIR PREVIOUS VALUES. A NEW C H FOR A RETRY OF THE STEP IS COMPUTED. THE ORDER IS KFPT FIXED.	027500 027510 027520 027530	
375		027450 027660 027670 027680	
0 4 6	\$10	02770 027710 027720 027730	
P. 5.	IREDO = 2 FLOTL=FLOAT(L) ETAO = ONE/((PIAS2*D/E)**(PTS/FLOTL) + ADDON) IF ((NOINDX .NE. 0) .OP. (KFLAG .NE. 0)) GO TO SAO ETAON = 2 PRO ** *** *** *** *** *** *** *** *** ***	027750 027760 027770 027780 027780	
0 61	C COMPUTE PATIN OF MEW H TO CURRENT H AT THE CUPRENT ORDED LESS ONE.  D = 7EQU  D 530 [ = 1.0N  530 0 = D + (V(I-L)/VMAX(I))++2  FND = F10TN=(T0(1)+505)++2	02781U 027820 027840 027840	
5	ETAGNI = ONE/(RIASI+ONENN)**(PTS/(FLOTL - ONE)) + ADDAN)  SAD ETAGNI = ZEAD  IF (L. FO. LMAX) 30 TO 550  C COMPUTE PATTO OF NEW H TO CUBHENT H AT CUPAENT ORDER PLUS ONE  CNOUNT = (T7(5)/COMP)**(H/TAU(2))***!	•	

ACTUAL PROGRAMMENT SECRETARIAN SECRETARIAN

004							027910	
		No 550 T = 1.N					027930	
	5.0	0 = 0 + ((Eap	OP(1) -	CNDUOT ** (I.L. WAX))/	YMAX([]) **?		027930	
	_	EUP = FLOTN+(TQ	(3) •EoS)	EUP # FLOTN*(10(3)*EDS)**2			027940	
	•	TAOP1 = ONE/IL	PIAS3*D/	EUP) ** (PT5/(FL0TL	. ONF.) . A	(NOC)	027950	
405	540	IOINDX = 2					027960	
		IF (ETAN .GE. E'	TAOPI) G	n TO 570			027970	
	_	IF (ETAOP1 .GT. ETAOM1) 60 TO 500	ETAGM1)	60 TO 600			08420	
		10 TO 590					027990	
	570	F (FTAO .LT. E'	TAUM1) G	O TO 590			028000	
410		IF ((ETAN .LT.	THRESHI	IF ((ETAD .LT. THRESH) .AND. (KFLAG .EG. 0)) GO TO	0)) GO TO 690	0	058010	
	_	ETA = ETAG					028620	
		IF ((KFLAG .LF2) .AND. (ETA .GT.	-2) .AN	D. (ETA "GT. ETAM)	ETAMXF)) ETA = E1	ETAWXF	028030	
		60 TO 180					028040	
	590	IF (FTAOM) -LT.	THRESH)	THRESH) GO TO 590			028020	
415	Ĭ	CALL ADJUST (Y, NO)	(ON				028060	
	_						028070	
	-	NO # 0N					029090	
	_	ETA = ETADW1					028090	
	-	NOINDX = L					028100	
420	Ŭ	60 TO 180					029110	
	600	IF (ETAOP1 .LT.	THRESHI GO TO	GO TO 690			028120	
	-	NO = F					028130	
	_	ETA = ETAOP1					028140	
	_						029150	
425		N. I = 1 019 00					028160	
	610						028170	
	•	NOINDX = L					028140	
	· ·	60 TO 180					058100	
DE#		OCCUPACHES INTO	S SECTION	THE SOR HORY CON	TO OF THE V	ADDAY	012020	
-	JAVE J	ACCIMINATED SIDE	POPS OF	THE WRONG COOFE.	THE DRUFF IS	SEDICED	028290	
•	S A A	E. TF POSSIBLE	THEN	C BY ONE IF POSSIBLE THEM HIS BEDUCED BY A FACTOR OF 0.1 AND	FACTOR OF 0.	1 AND	028240	
•	THE	TEP IS RETRIED.	. AFTER	A TOTAL OF 7 CONS	ECUTIVE FAIL	IIRES.	028250	
435	AN E	IT IS TAKEN WIT	TH KFLAG		•	•	028260	
	C						028270	
	630 1	IF (KFLAG .EG. KFH) GO TO 670	KFH) G0	TO 670			028290	
		F (NG .EG. 1) (	60 TO 64	_			029240	
	_	ETA = ETAMIN					001820	
011		CALL ADJUST (Y. NO)	ê				028310	
	. ر	NO					026320	
	Ζ.						056430	
	2 0	NOTE						
, 544	<u>ا</u> د	FIABRACETAMIN, FMIN/ARSCELL	Z-111.7	(H) Y			028360	
		I H IOFTA	•				028370	
		CALL DIFFUN(N.T.Y.SAVE)	.Y.SAVEI				028340	
	z	NFE # NFE + 1					058300	
	_	NO 650 I = 1.N					028400	
450	650	Y(1.2) # H*SAVE1(1)	VF.1 ( T.)				02A410	
	2 (	MOINDX = 10					028420	
	ا ت	60 TO 200	1			1	054630	
		OFFICE AND WANT THROUGH THE CONTRACT	THOUSE	i	AT CRACA OF			
<b>6</b> 54	כ זו אר	LOW THE CALLED	TO CHAM	THE MEKE S	STEP.		028440	
							029470	
•								

440	660							028490	
<b>4</b> A D	550							078490	
440		KFLAG = -1						1 1 1	
440		60 Tr 700				•		058440	
440	670	KFLAG = -2						024500	
		GO TO 700						028510	
	680	KFLAG = -3						028520	
		60 10 700						028530	
	069	ETAMAX = FTAMX3	AMX3					029540	
		IF (NSTEP .LE. 10)	LE. 101	ETAMAX =	ETAMX2			02850	
445	700	HOLD = H						028560	
		USTART = NO						028570	
	C	VI IS SMALL ENDUGH. COLLAPSE REGION 1	ENDUGH.	COLLAPSE	REGION 1.			028540	
		IF (V) .LT. VPER .V 1 I) MOD1=0	ERev11)M	091=0				02850	
	ر 14	THE PROJECT	ILE TRAV	EL IS LAR	GE ENOUGH. OPEN REGION		٠,	058600	
470		IF ( (OFFSET+SPJ) .GE.U.01)MOD4=1	SP J) . GE.	0.011M004				028410	
		IF (MVENT.NE.1)GO TO 800	.11GO TO	800				028620	
		IF (PR.LT.PJRS)Gn TO 800	RS160 TO	900				028630	
	704 0	ADJUST THE VENT OPENING.	1 OPENIN	•				05840	
		FIND THE DESTRED GASE PRESSURE.	ED 9ASE	PHESSURE.				059650	
475		PRASE = PUNT + 0 . N98146 + ACS/A4	0.098146	*ACS/A4 -	PURS			029640	
		RATIO=(PRASE-PR)/PRASE	E-04) / bd	ASE				029670	
		AVENT=AVENT+(1.0+AK+HATIO)	*(1.0+4K	*HATIO)				028690	
		IF ( AVENT.LT.AVMIN) AVENT=AVMIN	. AVMIN) A	VENTZAVMĮ	z			053690	
		IF (AVENT. GT. AVMAX) AVENT=AVMAX	AUMAX)A	VENTHAVMA	×			028700	
044	900	CONTINUE						02410	
		IF (KWRITF.NE.1) RETURN	E.1) RETU	Z				02820	
		WPITE(6+1000) NSTEP+NO+T+H+MOD1+MOD4	0) NSTEP+	20.T.H.MO	D1 • MOD4			028730	
	1001		214. 1P2E	12.4.6X.2	14)			028740	
		TMS=T#100.						028750	
4.45		CALL DIFFUN(N.T.Y.SAVE2)	(V.T.Y.S.	AVE2)				028740	
		WRITE (6.1010	0) TMS.Pl	,P3,PL,P4	#RITE(6+1010)TMS+Pl+P3+PL+P4+PP+SPS+VPS+SPJ+VPJ+APJ	J. VPJ. APJ		028770	
		WPI TE (6 . 101(	0) TMS, RH	1 . RHL3 . RH	#P[TE(6.1010)TMS.RH[.RHL3.RHG3.QH3.RHL4.RHG4.RH4	4G4 • RH4		028790	
		WRITE (6+101(	0) THS.V1	. VL3 . VG3 .	WRITE(6+1010)TMS+V1+VL3+VG3+V3+VL4+VG4+V4+EPS3+EPS4+AVFNT	FPS3.EPS4.	AVFNT	058200	
		WRITE (5.101	D) TMS. PM	1.RML3,RM	HRITE (5.1010) TMS. PMI. RML3. RMG3. RM3. PML4. RMG4. RM4. RMSUM	464 + RM4 + RMS	NO.	0.2840.0	
U64		WRITE (6.101(	D) TMS. 2H	D13.RMD3.	WRITE(6.1010)TMS.RMD13.RMD3.RMD34.RMD4.HL1.HL3.H3.HL4.H4	1.0 HL 3.0 H3.0 HL	*H*	028910	
		WRITE (6,101	0) TMS.CL	1,013,063	WRITE (6,1010) TMS.CL1.CL3.CG3.C3.CL4.CG4.C4.TEMP3.TFMP4	. TEMP3. TEN	ţ	028820	
		WRITE (6.101(	DITMS,EL	1.EL3.E63	WRITE(6,1010)TMS,EL1,EL3,EG3,EL4,EG4,EKPS,EKPJ,EKL4,EKG4,EG1)M	EKPJ.EKL4.	EKG4+ECIJN	028830	
		WRITE(6+1010) TMS+ (PML3(I) + I=1+10)	0) TMS . (P.	ML3(I) • I=	1.10)			028840	
		WPITE(6.1010) TMS. (PMD3(I).[=1.10)	0) TMS . (P!	403(I)·[=	1.10)			058820	
495		WRITE (6.1010) TMS. (PML4 (1).[=1,10)	0) TMS . (P	46(1).1=	1,10)			028860	
		WRITE (6.1010) TMS. (PMO4 (1).1=1.10)	0) TMS. (P!	=1 · (I) *0	1.10)			028870	
	1010	FORMAT (IPIIEII.4)	1E11.4)					024840	
		WRITE(6+1020) (Y(I+1)+I=1+N)	0) (Y(I)	(X•[H]•(				058830	
		WRITE(6.1020)(SAVE2(1),[=1.N)	0) (SAVE2	(I) , [= 1 .N	-			058300	
500	1020	FORMAT(1P10E12.4)	512.4)					028910	
		RETURN						029920	
				END OF S	END OF SURPOUTINE TSTEP			028930	
		END						028940	

CARD NR. SEVERITY NETAILS DIBGNOSIS OF PHOHLEM

224

AN IF STATEMENT MAY ME WORE EFFICIENT THAM A 2 OF M RPANCH CHMPUTED GO TO STATEMENT.

2

2

2

FTN 4.8.501

\$

30

35

5

SURROUTINE	JTINE COSET	T 75/76 OPT=1 POIND=+-+/ TRACE FTN 4.A+601	02/22/85	13.15.4
99	-	NOM1 = NO = 1 GO TO (1, 2), METH MAXOER = 12 GO TO 100	029520 029530 029540 029550	
!	ບ ^ ເ	MAXDER = 5 60 TO 200	029570 029570 029570	
r •	100	IF (NG .NE. 1) GO TU 110 EL(1) = ONE EL(2) = ONE TO 1) = ONF	029410 029410 029420 029430	
ç.	110		029650 029650 029650 029650 029670	
ႊ	115	w	029690 029790 029720 029720	
0		IF ((J.NE. NOMI) .OR. (NOINDX .NE. 1)) GO TO 130 S = ONE CSUM = ZEPO DO 120 I = 1,NOM1 CSUM=CSIP4.S*EM(I)/FLOAT(I+1)	029740 029750 029750 029770 029780	
<del>د</del> ج	130	SAMDSS+EM PHSUM [RACK = 1 J + 2) -	029790 02990 029810 029820	
06	140 150 0 00M	40 EM(I) = EM(I) + EM(I-1)*RXI 50 HSIM = HSUM + TAJ(J) COMPUTE INTEGRAL FROM -1 TO 0 OF POLYNOMIAL AND OF X TIMES IT S = ONE EMO = ZFRO	029840 029850 029850 029870	
ę.		CSUM = ZEDO DO 160 I = 10AQ FLOTI=FLOAT(I) ENO = ENO + S*EM(I)/FLOTI CS!)H = CSUH + S*EM(I)/(FLOTI+1)	029490 029910 029920 029930	
¢ 0 2	280 13	S = -5 EL, FORM COEFFICIENTS OF NORMALIZED INTEGRATED POLYNOWIAL, S = ONE/EMD EL(1) = ONE DO 170 I = 1.00	029940 029950 029950 029970 029980	
105	170	EL(I+1)=S*EM(I)/FLOAT(I)  XI = HSUM/H TG(2) = AMDSS*XI*EYO/CSUM TG(5) = XI/EL(L) IF (FIGIN)X / MF (1) IF (FIGIN)X / MF (1)	029990 030010 030070 030030	
11،	S C C C		030040	
	0 2		1111111	

C COMPUTF INTEGRAL OF POLYNOWIAL. ------

115

CSIN = ZFR0 D0 190 T = 1.L CSUMESCEW(I)/FLUAT(I-1) S = -4 T0(3) = AHDSS\*FLOTL\*EW0/CS!IM

190

120

60 Th 300

200 210

125

130

135

C IN EL. CONSTRUCT COEFFICIENTS OF (1+X/XI(1))\*...\*(1+X/XI(J+1)). ---HSUM # HSUM + TAU(J)
HSUM1 = HSUM1 + TAU(J)
PROD = PROD\*(HSUM/HSUM1)

TQ(2) = AHDSS-EL(2)+(ONE + PROD) TQ(5) = (ONE + PROD)/EL(L) IF (NGINDX -NE, 1) GO TO 300

145

150

ELP = EL(2) - RXI TO(1) = AHDSS+ELP/CNOMI

= (J + 3) = IBACK L(I)=EL(I) + EL(I-1)+RXI

# AMDSS#FLP#AXI\* (ONE + PROD) + (FLOTL + ONE)
# CORTES#T0(2)

300

----- END OF SURPOUTINE COSET -----

CARR NO. SFVFRITY NETAILS NIAGNOSIS OF PHOBLEM

14.0

SURBOUTIN	SUPPOUTINE ADJUST (Y. MD)		030530
C	******************************		030540
	THIS SURPOLITINE ANGUSTS THE Y ARRAY ON REDUCTION OF	je opner.	030540
C SEE REFERENCE	I FOR DETAILS.		030560
CAUTION	USED IN		030580
			030590
DIMENSION Y (NO.13)	Y (NO • 13)		03050
	COMPON /FDCOM1/ T.H.HMIN.HMAX.EPS. <s.ubound.k.mf.kflag.ustart< td=""><td>WF . KFLAG . JSTART</td><td>930520</td></s.ubound.k.mf.kflag.ustart<>	WF . KFLAG . JSTART	930520
3/ NOMMOD	COMMON /EPCMIN/ TAU(13) .FL(13) .TD(5) .LMAX .METH .NO.L .NDI'ILX	4.NO.L.NOT'ICX	030430
DATA ONE!	DATA ONE/1.0E0/.ZERU/0.0E0/		030640
IF IND .E	IF (NO .EO. 2) PETURY		030420
			030540
CN # ZHON	7 -		0.0000
60 10 110	60 TO (100• Zao)• MEIH		0.5050
011 00 001	X43 10 1 H T		030700
61.13	7500		030710
•			030720
COMP H MICH			030730
DO 130 - 1 1 NOW?	1.NOM2		030740
C CONSTRUCT COF	CONSTRUCT COFFERCIFICATIONS OF X*(X+XI(1))**(X+XI(U))		030750
	•	•	030760
ST H LX	H/MISH		030770
+	-		030790
00 120	DO 120 18ACK = 1.JP1		030790
- N -	7 H (1 + 3) - 19ACK		030800
120 FL(T)			030810
ຮ			030450
C CONSTRUCT COE	POLYNOMIAL.		030830
P 041 06	00 140 J = 2.NOM1		03040
140 EL (J+1)=F	.OAT (NO) +EL (J) /FLOAT (J)		030420
GO TO 300			030460
v			030870
2	210 J # 1.LMAX		030440
•	= 2ERn		030490
ŭ			030400
HSUM . ZERO	•		030910
. C 062 00	J = 1,40M2		030920
C CONSTRUCT COE	C CONSTRUCT COEFFICIENTS OF X*X*(X+XI(1)) * * (X+XI(J))	· ((C)	030930
MSIM = MSIM	ISUM + TAU(J)		030040
H/HRSH # IX	X.E.		030020
1 + 7 = 147			030460
Dn 226	DO 220 IMACK = 1.JP1		030910
	I = (7 + 4) - IBACK		030940
220 FL (T)			030990
5			031000
			0.1010
C SUBTRACT CORP.	C CHRIBACT CORPECTION TEAMS FROM Y ARRAY,		031020
* 1. 545 00 045			031030
	2. T		040 (50
1 11 0			2100
Č			040160
0			031070
	FOR CA PROPERTY PO CAR THE THEFT		000100

gypicel™centectel™shiphean Nisboppol Department (Server of Preserve Server of Server (Server) Server (Server)

AN IT STATEMENT MAY BE MOME EFFICIENT THAN A 2 OR 3 BRANCH COMPUTED GO TO STATEMENT.

					031100
•	Q 4	) • CON • '41 TE 4	IFP. NSO. YMÅK.S.	AVE 1.5AVE?.	031150
1	PSET IS CALLED BY TSTEP TO COMPUTE AND TO PROCESS THE MATRIX PR. I (H/EL(2)) -J. WHEGE J IS AN APPROXIMATION TO THE AND THE HERP SUIPPLIED.	TO COMPLITE	AND TO PROCESS APPROXIMATION	THE MATRIX TO THE	031150
	SUBPOUTINE PEEEDV, WHEN MITER = 1. OR BY FINITE DIFFERENCES. WHEN MITER = 2. J IS STORED IN PW AND REPLACED BY P. USING	WITER = 1.	OR BY FINITE DIFFERENCES. AND REPLACED BY P. USING	TFFEGENCES. Y P. USING	031170
	CON = -H/EL(2). THEM P IS SUGJECTED TO AN LU DECOMPOSITI FOR LATEP SOLUTION OF LINEAR ALGEGRAIC SYSTEMS WITH P AS COEFFICIFNI MATRIX.	IS SIIGJECTEI INEAP ALGE9P	O TO AN LU DEC AIC SYSTEMS WI	TH P AS THE	031200
2 2	> ⊢ ∝	S DESCRIHED DEINED DESCRIHED DESCRIPE D	PPEVIOUSLY. CO	MMUNICATION BIAN INCPFMENTS.	031230 031230 031240 031250
CAUT	TON NOT DIMENSION	VARIABLES	ALL EPCOMI VARIARLES ARE USEN INTHIS SURBOUTT Y (100-13) YMAK (NO) SAVEJ (NO) SAVEZ (NO) PW (NSO) TPIV (NO)	Stinpourtive.	031290 031290 031300 031310
U	DIMENSION SAVESTROS COMMON /FPCOMB/ T.H.MMIN.HMAX.EPS.SS.UPOUND.N.MF.KFLAG.JSTART COMMON/FPCOMB/FPSJ.NSOR COMMON/FPCOM9/HUSED.NOUSED.NSTEP.NFE.NJE.NMI DATA ONE/1.0En/.PEP/1.0E-3/.ZEPO/0.7E0/	HHIN•HMAX•E NSOR •NOUSED•NSTE 71.0E-37.2EP	PS.SS.UPAUND.N P.NFE.NJE.NMI 370.160/	I.MF.KFLAG.JSTART	031340 031340 031350 031370
C 17 1	CALL CALL ERV (NO	70 20 24 AND MULTI 7. PW. NO)	2) 60 TO 20 PEDERV AND MULTIPLY RY & SCALAR. 1. T. Y. PW. NO.) 1. CON		0314160 031400 0314160 054160
C 1F 3	60 TO 40 41 TER = 2 MAKE N CALLS D = 7 FGO D = 1 * 1 * N U = 0 * SAVEZ(1)**2	LS TO DIFFU	TO DIFFUN TO APPROXIMATE	TE J	031450
	01 = 0 10 = 0 11 = 0 10 = 0 10 = 10 10 = 10				031500 031500 031510 031510
	FEARTAI (F.D.) Y(J-1) = Y(J-1) + R D = CON/9 CALL DIFFUN(NO.T.Y.SAVF1) DO 40 I = 1.01				031540 031550 031570
0 4 0 4 0 4 0 4 0 4 0 4 0 4 0 4 0 4 0 4	PW(I+J1) = (SAVE1(I) Y(J+1) = YJ J1 = J1 + NO CONTINE ON THE FOEMTITY MATHEX. J = 1	. :	SAVE 2 (1) 1 en		03150 03150 031510 031510 051160
4.0	00 70 1 = 144 DW(,)) = PW(,)) + OM( J = J + (*10 + 1)	<u>a</u>			031440 031450 931450

13.15.44 DASE	
02/22/HS 13.15.44	031470 031490 031490 031700 031710
FTP. 4.4449]	
76/75 APT=1 801110=+-4/ TUACE	C GET LU DFCOMPOSITION DF P
74/75	LU DECOPPOSITI CALL DECOMP("1, NMIRNAIL1 RETHIPN END
Suspontlye psET	C GET LU CAL O WHI

C	0.51.730
### FEFFER SUPSTITUTION   ### FEFFER FOLCE   ### FE	031740
CONTINUE	031770
00	
	031410
	031920
	031830
	031460
	031450
	03180
	031970
	000000
	006160
	016160
	050150
	036.66
	0.0160
2222	02150
3.00	000000
	000166
	000000
	010200
	0.000
	0.32010
	0.4046
	035040
	040250
	070250
	000000
	00000
	035110
	021250
	0.56130
	041000
	031250
	001200
_	0.1250
CONTINUE CONTINUE CONTINUE CONTINUE (N) - NE (N) (O) TO	061260
CONTINUE KP=[PS(u) IF(il_(KP*N).NE.n.n)GO TO	06120
	002250
TA COL CANANA SAE STORE TO	010000
	00000
(2) MIC   COLUMN   CO	032260
19 RETIEN	0.42260

giran baranan danmar kasasaan baranar aranan baranar anaman anamar anamar anamar aranan dang

~

	SUBBOUITINE SOLVE	SOLVE	76/76	OPT=1	400rd	76/76 OPT=1 40UND=+-+/ TRACE	ا۵۹۵	11.	FTN 4.8461	02/22/A5 13.15.44	13.15.44	2
		J.	SURPOUTINE SOLVE(N. 401M.UL. IPS.H.X)	)L VF (*)•	1• #1 G5	/L•1P5•	. (x*t			032840		
	•	Ę	1 mers 101 . 11 .	NO IM.	1. (*10	(1 (n) Sa)	(H10H) 11 (H10H) + (H10H) + LOS (H1) [H) + H (H10H) + X (H10H)	£.		032570		
		•	10 = 10h							0.32560		
		_	[P=1PS(1)							03550		
a,		^	x(1)=8(1P)							032100		
		u	N. 5 I 5 00							032110		
		_	(I)Sdl=dl							032320		
		_	1-1=1w1							032330		
			SU*=0.0							032340		
10		u	DO 1 J=1.141							032350		
		,	SIM=SUM+IIL (IP.J) +X (J)	) X • ( C •	S					032360		
	-	~	K(1)=4(1P)-SUM	Ī						032370		
			(N) SdI =d)							032340		
		_	(N) = X (N) / () L ( 1 P · N)	(N•d)						032340		
<u>.</u>	,.	u	DO 4 19ACK=2.N	Z						032400		
•		-	=NP1-IMACK							032410		
			(P=195(I)							035420		
		-	[P]=1 +1							032430		
			O.CHMIN.							032440		
20		_	00 3 J=191+N							032450		
			SIM=SIJM+(IL (IP+J) *X(J)	) X * ( ) * (	S					032460		
	-		K(I) = (X(I) - SUM) /UL (IP. I)	18) /UL (	IP.I)					032470		
			RETURN							032440		
		•	CZ							032440		

ADDUTINE SING	16/16	APT=1 ROUND=+-4/ TRACF	FTN 4.8.50]	92/22/45	13/22/45 13.15.64	PAGE
	SURPOUTINE SING(I 4HY)	(AHFI) SWI		032200		
	NOUT=6			032510		
	IF ( TWHY . EQ. 1)	WAITE (NOUT . 1 1)		032520		
	IF (TWHY.EO. 2	IF (TWHY ED. 2) WRITE (NOUT . 12)		032530		
11	FORMAT (1HO. ")	4ATPIX WITH ZEDO ROW IN DECOME	P05E. 1)	032540		
2	FORMAT(1HO.	12 FORMAT(1HO. SING MATMIX IN DECOMPOSE. ZEPO DIVIDE IN SCLVE.")	PO DIVIDE IN SPLVE.*)	032550		
	PETIJPN			032560		
	C 24			032570		

## APPENDIX B

Below is a listing of the job stream for the above test problem (initial gas pressure = 10 MPa). Following is a listing of the output. Since there are many variables to keep track of, the output is on multiple files. Only the ones of interest for a particular problem need to be printed out. Additional files contain the values of interest for a problem with a droplet option.



```
I will be to the state of the terms of the t
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          DIS COFFE WS. PLSTON TOAMEL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          HINE SAS COVOLUTE
                                                                                                                                                                                                                                                                           OISPOSE.TAPELL: UNablations are infantal in the DISPOSE.TAPELL: Unablations are infantal infantal infantal in the DISPOSE.TAPELL: Unablations are infantal infantal infantal in the DISPOSE.TAPELL: Unablations are infantal infa
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           POSTICTILE PUSTSTANCE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  THE GY GRAMA
THE GY GRAMA
SUN FACE TENSION
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  PISTON REINTANCE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     PER SES LAPLE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            IFFSCT T. 1VIL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ONTHANSANTAG OF
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    315174 4-1541
4-464
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 04 0614
2013 16154F
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          See C
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           .;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          Š
TEORY,STWEZ,TC,Dt.
ACCOUNT,DONNEYPO,
ATTACH,TC,PLCHATC,TD,TTS,SECH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  7.13365 +1.7
9.50E=1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         1.065-01
2.41315-63
1.2495-90
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    2. 6'4f + 3
2. 4.47 + 3;
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                1.065-06
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             3.5435 ( 4. 1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      1,0,1,6,1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 7.03F+11.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     0.00t + 10
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        5.428-01
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       5.806-11
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     1.425 4.1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    1.006.01
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         1.036-1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                1.7571 +0.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       1.27F +00
2.50F +00
1.944F +02
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         1.00 € .00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       1.006-03
1.3006+01
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   2.1336F+02
1.230E+00
3.3309E+03
3.53E+01
1.9019E+01
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      1.005-04
1.006-04
22 C
SFVINED
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             9.600035.01
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         0.005.00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  0.00 € +00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       1.005 +00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 0.00F+AU
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     0.00F +nr)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         9.0CE+0U
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          4.308205+02
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     1.0ce+n
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         1.00F-12
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  250052
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   14040
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       IHIOd
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          0.151
```

```
WYDPOLIC DIFF = 1.734AE.01 HYDPOLIC DIFF = 1.7340F.01
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   DIS COEFF = 5.4000F-01
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         PIS RESISTANCE * PIS RESISTANCE *
                                                                                                                                                                                                                VOL = 1.3140E+02
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     .
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         DIS COEFF VS. PISTON TRAVEL
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         PIS TRAV = 0.
PIS TPAV = 7.3846E+00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        PIS TRAV = 0.
PIS TRAV = 7.3846E+00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     PESISTIVE PRESS = 3.6200E+01
RESISTIVE PRESS = 1.0000E-01
RESISTIVE PRESS = 1.0000E-01
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  POES GAS = 1.0000F.01
                                                                                                                                                                                                                                                                              AREA COMB = 1.5440E+01
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   COVOLUME = 1.2570E+00
                                                                                  TURE AREA = 4.90A7E+00
                                                                                                                                                                                                                                                                                                                                                                                            VENT AREA = 2.49005.00 VENT AREA = 2.49005.00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             BORE/STROKE = 6.0119F-01
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    GAM = 1.25005+00
                                   TRAVEL = 2.1334E+02
as*=30=01=6d=N015h1+110110 d=10=000
                                                                                                                                                                                                                                                                                                                             VENT AREA TABLE
                                                                                                                                                                                                                V3 IN # 3.5396F+01
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      #
=
                                                                                                               THE ENTRANCE COFFF = 9.5000E-01
                                                                                                                                                                                                                                                                                                                                                                                                                                           MAX PISTON TRAVEL = 7.3846E+00
                                                                                                                                                   = LMSd
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          COMPUSTOR LENGTH = 3.4502E+01
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     CUPFACE TENSION = 3.6300E+01
                                                                                                                                                                                NO BACK FLOW
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           FRAC PIS TRAV = 0.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         FOAC PIS TRAV = 0.
Frac PIS TRAV = 1.0000E+00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      THEM FNERGY = 3.33095+03
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  PBFS LIJHID = 4.4000E+00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        DENS LIGHTD = 1.2300E+00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 MAL WT GAS = 1.9010E+01
                                                                                  THBE DIAM = 2.5000F+00
                                                                                                                                                                                                                                                                                 1854 FUEL = 1.3000E+01
                                                                                                                                                                                                                                                                                                                                                                                             PIS TRAV = 0.
PIS TRAV = 1.0000E+00
                                  OFFSET = 1.2700F.00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      TRAVEL = 1.0000E-02
                                                                                                                                                                                                                V1 IN = 9.5000E.01
                                                                                                                                                   1.94405.02
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              ANRE = 4.4396E+00
                                                                                                                                                                                                                                                VAER # 1.0000E-03
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         PAVEL =
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          # 0044N
                                                                                                                                                                                                                                                                                                                                                                NVENT #
                                                                                                                                                                                   HRACK =
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              = SIdN
                                                                                                                                                    # LHCd
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            N DON
                                                                                                                                                                                                                                                                                                                                  VENTI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            nisi
```

院のためは ・ 関係のは ・ できない。 ・ でき

cpecific gas constant = 4.3756F-01

CV = 1.6429F+00 CP = 2.1205E+00

DPOP1 INSTAN BURNING

NO PRIMER

NPRIM = 1

12100

ÎIº15 = 1.0000E-04

C/M = 6.1211E-01

PRIMER = 4.7392E-01

LOADING DENSITY = 9.0562E-01

CH406E = 1.1852F+02

( ( ( ) )	l d	P3	๔	<b>\$</b>	œ d	S d	Sd A	۲a ۶		ACC K-G
000.0	9.000	•	ė	0.00	10.000	_	0	00000	5	c
001.	10.061		ė	0.05	10.055	0	95	00000	0.00	_
.200	11.547	11,569		.5	11.567	.013	0.11	00000	6	
.300	14.104		4	4.05	14.058	∿	Ξ.	00000	6	_
004.	17.818	•	17,725	.72	17,725	050.	~	0.00	000.0	00000
500	150.62	6	ά,	•	Š	.0A2	6.53	9		_
.609	30,157	29. A47	29. R34	29.834	29.834	.124	496.527		00000	000.0
.700	39.754		6	-	16	.182	4.13	6	: -:	···
004.	52.490	7:1	_:	4	37	N	79.5A	20	618.044	3.19
006.	68.844		é	.76	7	E.	51.57	15	2099.807	17,139
1.000	89.230	•	33	5.28	A5.190	104.	68	\$	17	6
1.100	113.874		06.5A	06.58	99	65	870,33	4	419.78	*
1.200	142,580	131,197	129,925	129.728	129,336	. A6K	201.	1.757	9390.959	33,250
1.300	174.500		53.62	53,25	52.	1	5.	Aĥ	947.88	7
1.400	207.989	•	76.07	75.41	:	•	042.05	• 36	073,85	26
1.500	240,595	02.60	'n	94.55	38	۲.	357.04	•	1707.92	•
1.600	269,353	21.15	Ξ	09,35	*	ઃ	508.65	•	6746.26	O.
1.700	291.449	234.992	221,384	219.038	214,346	2.429	3534,719	11,658	32063.739	55,121
1.400	305.121	43.48	56.	23.42	29	۲.	477.4A	•	7521.75	•
1.900	310.149	46.63	226.812	22.91	12	7	368.92	·	2987.79	m
2.000	308.012	70	8	18,35	209,043	4	251.96	3.7	A348.6	3.76
001.6	300.742	7	Ξ	10.82	200.254	۲.	148.89	8.8	518.9	64.
2.200	290.497	232,286	207,327		189.837	4.0A3	65	34.427	8443.	48.815
2,300	278.859	7	77	91.49	178.942	~	14.606	5.0	3096.8	5.01
004.2	266.929	-	3	81.66	168.373	•	946.23	٠,	7477.5	3.29
· •										
2.500	255.456	.16	70,13	172.190	158,303	4.974	2901,867	•	71597.777	40.702
2.600	244,627	<b>5.</b>	٠.	62.B	\$0	O.	862.02	'n,	5466.80	=
2.700	234,225	8.09	61.55	4.24	39.61	r.	A22.49	6	9100.24	989
2.800	224.537	0.29	53.78	46.34	31.44	Œ	4.50	9	2518.62	5 ° 6
7.900	215.57A	3.06	46.62	9.09	24.03	~	747.54	5.	5740.41	. 86
3.000	207.294	6	6	46	17.	6.378	32		3.0	30.147
3.100	199.447	2	0	9	Ξ.	4	675.96	93.	562.7	28.564
3.200	192.529	154.576	2		105.520	6.913	2641.261	112,632	394.	27.122
3.100	186.096	*	23.4	15.77	:	.17	607,60	25.	1.0669	25.A07
3.400	00000	137,854	118.649	10.97	95.620	. 3a	00.	32.	442.6	24.575
1,500	000		10.94	9	6	3	00	42.091	01793.8	٠,
2.600	000.0	3	2.7	95.40	7	6	00	52,379	0.3944.6	;
200		96.0	94.286	A7.017	75,179	7.380	000,0	162.874	105921.085	19,316
9.800	00.0		7.22	2	9	3	6	73,558	07742.4	
		4		7	2	2	6		0426.7	ć
) • F	000.0	•	•	•	•	•	•	•		•
4.000	000.0	.75	5,30	H	4.11	•3A	٥.	5.440	110989.640	15.353
4.100	000"6	71.629	70.415	65.523	55.739	7.3A0	0.000	412	5444.4	Ξ
4.150	000-0	д.	7.54	95	3.50	.39	.00	3.384	4570.¢	3

								689
1136.1	310.2	744.6	226.8	217.2	55.9	.07	2.20	NSTED #
MIZZLE VFL (M/SEC)	LDA)	MPA)	(MPA)	( V O 7	(K-G)	MAX MASS FIREDR	MAX ENERGY ERROR	2.5
<b>&gt;</b>	~ ~	53	بر	œ	ü	4455	N.	34
72.75	(wam) ld xtm	MAX P3 (MPA)	MAX PL	MAX PR (MDA)	MAX ACC	* XAM	MAN	BIN TIME

(%) +	110	9HL3	ESHO	внз	PHC	8 H G	α 1
	1 2344	6	000	-	0000	000	4110
	1 2 3 6 1			2110		000	=
	10001			: -	0000	2	
	7,50			; ;	•		
0004	1.2391	0000	0000	.0203	000000	0.000	.0183
•	•	•					
. 5000	1.241A	0.000	0000.0	. 1261			.0224
. 4000	. 245	.000		.0339	000.	ê	٠,
. 7000	1.2504	6	ë.	1440.	900	5	.0369
0004.	.257	.000	.000	.0571	.000	ē	.0473
0006	.265	.000	000.	.0731	. 00.	5	.0609
0000	276	6	0.0	0860	000	6	7.8
			0	_	0	5	.0978
0000	90		0	-	000		119
1.3000		2	000	. 1595	00.	00	*
1.4000	340	•	.00		.000	ē.	1091
		2		2012	9	000	7.7
	•		0000	2176	000	0.000	6
	1 38 70		•	1022		֓֞֜֜֜֝֓֓֓֓֓֜֜֜֜֓֓֓֓֜֜֜֜֓֓֓֓֓֓֡֜֜֜֜֓֓֓֓֡֜֜֝֓֡֡֡֡	5
•	•	<b>,</b>		986			200
	•	•		26.45	: =		2107
	•	•					
٠,	Ę.		.000	.2445	0.000.0	.00.	.2108
100	٤.	0.000.0	000-	•	Ē	.000	. 20AS
2,2000	1.3874	•	¢	.2394	9	•	4
٣.	Ę.	8	.00.	•	Ę.	.00.	
•••	31	.0	•00•	•	6	000	.1943
8	•	000	000	•	000	.000	1887
	1.3612	000	000	216	.00	0.0000	182
700		000	900	-2107	•	00.	_
٠,		000	.00	204	.000	.000	171
2.3000	1.3449	C	0.000	194	.000	.000	.1642
	- 7	000000	000	•	000	000	.1412
0001-6	1.3341	000		-	8	·c	.1563
		c	000	Ξ	000	.000	5
.307	٦,	.000	000	17	.000	S	•
400	Ε,	.000	.000	169	.000	000	.1433
	٠,	.000	.000	.1511	.000	.00	ě
	٦,	000	000		000	000.	129
•		000	000	_	000	000	-
•		000	000	1271	100	.000	
3.000	1.3240	00000	00000	1209	0.00.0	0.0000	Ξ
	:	:	•	1			
4.0000	1.3260	0000-6		.1151	C	0.0000	.1054
₹.100€	•	c	0.000	٩,	0=0	000	5 6
4.1500		0.000.0	C 0 0 0	c	ė	0.000	troc.
•	) . Till	602C.	53				

AVENT	6	6	2.490	64	9	٠.	2.490	1	٠.	•	٠.	٠.	•	2.490	•	٠,	٠.		٠.	•	•	•	•	⁴.	•	64.	2.490	6	•	ç	2.490	٠,	•	4.	6	2.490	\$	•	•	•	•	Ç	٠,	
<b>₽</b> Sd's		ç	•	0.00	.00	5	0.000	00.	0.0.0	90	.00	.00	٤.	00.00	• •	ě.	0	0.00	0	.00	.00	0.00	• 00	.00	6.	•	0.00	•	•	•	90	.00	0000	9	.00	•	٤.	c	٠.	•	.00	0.00	.00	
EPS 3	.00	ë.	0000	ou.	.00	00000	000.0	0.000	0.00	000.0	٠.	٠.	•	000.0	•	٠.	ć.	0.00	٠.	•	0.000	0000	۰.	ċ	٠.	6	000.0	ę.	9	9	90.	9	00000	ŝ	ē.		ë	S	ę.	6	00000	0.000	0.00	
4 >		٠.	N	۲.	٠.	~	6.234	٧.	Ľ.	٠.	9	°.	9.	20,315	ç		σ	63.460	£	C	2.12	•	5.22	5.05	7.12	_:	307,378	ŝ	'n	Ġ.	4.14	3.44	LC)	06.09	4.31	03.72	54,22	un .	5A.1A	11.49	65,59	1020.440	053.68	
٧٥,		•	0.000	•	0.000	•	0.00	•	•	•		•	٠	0.00	•	•	•	0.000	•	•	•	0.00	•	•	•	e.	0.00	.00	ç	.00	.00	90.	0.00	.0	.0	.00	:00	0.000	.03	.00	60.	0.00	.00	
۷۲۴	5	٤	000.0	ě.	Ę	00	0.000	9	5	ç	.00	5.	9	0000	ë.	9	٤	00000	2	8	6.	0000	8	8	9	.0	0.00	.00	90.	9	.00	5	0.00	0	.00	.0	ē.	0.000	ë.	9	90	00000	5.	
۲3	Lf1		÷	٠.	6.1	6.65	37,323	8.21	9.40	ď	3.00	5.58	8.90	52,683	7.17	2.17	7.50	72.980	8.42	3.72	88.848	3.7	9.6		07.89	12.42	116.84	21.28	25.62	29.90	*	38.	•	46.	6	49.6	49.6	÷	49.6	40.4	6	3		
r 9 A	0.000	0.00	006.6	000.0	000.0	5	000.0	2	õ	9	8	9	٠,	0000	8	0	0	000.0	00	9	ē.	0.00	9	00.	00.	۰.	0.000	e.	٩	٠.	6	90.	0.00	9	ê.	۰.	٩	0.0.0	٩	٩.	90	000.0	.00	233KLNS
٧٤.۶	6.	:	000.0	ε.	6.	·.	000.0	ċ	٩.	ç.	0.000	00000	0.000	0.000	000.0	.00	900	0.000	ë.	.00	0.000	000.0	0.00	0.000	000.0	.00	0000	٥.	ë.	6	00.	ε.	000.0	ë.	ë.	0	00.	0.00	6	e.	00	0.000	0.	, 20,
	٨.00	5.35	95.836	. 43	95.34A	•	94.382	3	m	~	89.614	87.440	R4.737	A1.4A2	77.709	73.511	60.032	64.438	59.867	55.414	11	ċ	2.91	6	Ξ.	13.	27,567	.87	.25	.63	90	5	6.126	7.	• 05	.055	S	• 055	.054	. 055	.055	.055	.05	. FA: T
(/2) +	c	5	002.	30	Ç	.500	00.4.	.700	004.	.900	1.000	1.109	1.200	3	1.400	1.500	1.600	1.700	1.900	1.900	0	2.100	.20	30	04.	2.500	5.600	2.700	2.400	• •	3.000	3.100	3.200	3.300	3.400	3.500	3.600	3.700	3.400	3.900	000**	4.100	4.150	ï

A.521	0.000	•	.403	.000	0.00	.071	<b>00</b> 1
.51.9	0.000	•	404.	000.0	•	.071	Ė
•	0.00		.470	000.0	9	910	•
.325	0.000	0000	.577	000.0	60.	460.	118.005
H.147	000.0	•	• (3)	000.0	00000	•11.	•
7.89€	5	c.	.957	-	۰.	.142	9.00
1.550	0.00	000.0	1.265	6	9	.1 AO	<u>.</u>
7.081	90.	٩.	1.684	•	•	.230	9.99
6.446	.00	٠.	5.249	۰	0	.300	18.99
15.575	00.	e.	2.094	•	0.00	• 425	õ
4.37	00	ë.	3,957	000.0	٠.	. 560	÷.
1	00		5.171	9	0000		
10.570	0.000	00	6.655	0000	C	1.770	Ë.
7.73	.00	•	8.405	00	•		÷
2	00.	00.	10.382	5	0.000		19.
8	•	•		00.	0.00	6.548	
94.937	00000	000.0	14.687	.09	0.00	9.372	18.9
	•	•	•	0.00	00000	2.77	ė
e.	•	•	•		0.00	16,726	è.
17.509			20.364	.00	0.000	1.13	0.
_	•	0000	1.7	00.		25,866	·
'n		000.0	Ň	000.0	0.000	•	6.
ŏ		000.0	ë	000.0	0.000	35.840	£
53.814	0.00	0000	24.226	0.000	0.000	40.933	118.974
	•	0.00	;	0.00	0.00		ċ
•		8	'n	0.000	0.000	-	_
37,525	•	8	ŝ	•	00000	.18	œ
32.354	0.000	0.00	25.549	0.00	0.000	61,152	5
	•	5	ů	•	000.0	ť	or.
•	•	8	'n	0.00.0	000.0	85	119.055
17.537	00	8	•	0.000	0.000	9	•
12.803	e.	6		00000	0.000	28	119,053
A.162	0.000	000.0	26.035	000.0	0.0.0	84.850	119.053
3.607	9	6		0.000	0.000	37	•
.073	ë.	S		•	0000	73	119.052
.073	•	9	22.610	0.000	0.000	36	119,053
.073	•	6	~	0.00	0.000	6	.61
.073	00000	0.00	٠.	0.00	00.0	98.948	5.
.073	•	Ę	19.017	0000	0.000	3	•
.073		0.00	1A.082	0.000	0.000	5	119,058
		•	5	6	6	76	ď
			- 4			102 567	
E 6	•	0.00	2	00000	000.0	7.	24.00
F 40							

T (4S)	9MD13	PN03	RMD34	RM04	ř	두 3	m m	¥	Í
	0.000	00000	00000	00000	3338,190	0.000	4209.504	00000	4209.504
100	517,707	000	59.279	000	3339.066	0.000	4207,164	0000	4214. 130
000				0000	3740.275	0.00	4147.497	000.0	497.05.4
				00000	3342,300	0000	4145.584	000.0	4473.91R
004	2114.147	0.000		000.0	3345,290	0.000	4146.5A3	00000	4617.923
•	4 . 4 . 4	•			,,,,			•	
005.	77.0457	0000		0000	00000000	0000		0000	255.00.0
.66.	291.1.10	0.000	6.46.563	0000	3355-113	00u•0	4143,546	000 0	6H5H-119
.700		0000		00000	3362.692	0.00	4120.000	0000	4950.690
. 400		000.0		0.000	3372.657	0.000	4119.34A	000.0	5013.426
960.	10178.117	0.000	1699,733	0.000	3345.297	0.00	4111,269	0.000	4984.929
1.000	13948.401	0.00	3109,937	0.00	3400.811	0.000	4092.HT4	0.000	4887.967
001-1	_	000.0	5368	0.000	3419.213	•	4054.545	00000	4766.108
1.200		0000		0.00	3440.149	0.00	4028.492	0.00	4651,139
1,300		0000	~	0.000	3462.A73	0.000	3947.185	0.00	4550.359
1.400	39247.295	0.009	18573.79	0.000	3446.032	0.000	3943,762	000.0	4460.526
	46404.063	0	24692.8KD	0000	3507.944	0.00	1900.227	00000	4176.986
	Escal 33				35.26.75R		1857 079		429K 146
602.					3540.893		3813,574	000	4215.415
	787 6000		•		3549.501		376B 680		A133.333
- 20					3663 466		3731 030		10 10 10 10 10 10 10 10 10 10 10 10 10 1
006• <b>1</b>		0000	•	000.0	1556.66	00000	3/61.430	0000	166.4404
2,000	60573,637	00000	48455,109	0.000	3551,309	0.00	3673,575	0000	3964,957
2,100		00000	5011	000.0	3546.756	0.000	3625,310	0.000	38 41 . 1 29
2.290		0.000		0.000	3540.290	0.000	357A,960	00000	3799.958
2,300		0.000	_	000.0	3532.873	0.00	3536.430	00000	
2.400		00000	50745.310	0.00	3525.190	0.000	3499.212	000.0	3653,374
		•	50267.243	000	3417,725		3467.744	0.00	3589.466
2.600	52307.341	0000		: 0	3510.610	0.00	3440,707	0000	3529.055
2,700		000-0		00000	3503.712	0.000	3417,504	00000	1475.289
2.800		00000	_	0.00	3497.230	0.000	3398,276	00000	3424.649
2.900	44A39,252	0.000	•	0.000	3491.198	0000	3382,40R	000.0	3382,747
900	47822,374	000	47034.921	0000	3485,560	000	1359,434	00000	3343,110
3.109		0.000	•	0.000	3440,326	0000	3358, 478	000.0	3307.293
3.200		00000	-	000.0	3475.493	0.00	3350,377	00000	3274.950
3.300	•	0.000	•	0.000	3470.968	0.000	3343,525	00000	3245.422
3.400	0.00	0.000		0.000	3330.900	0.000	3294,504	000.0	3217,366
3,500		00000	18035.815	00000	3330.960	0.000	3156,951	00000	3165,638
			12016 954	000	3330.000	000	1079.401	000	1101.924
2000			10612.194		000.0666		3017.613	000	3044.410
			0346 140				2061 726		2000 71B
10 C			8067 58		מולי חברר	• •	2000, 600		2936.755
0000		•		3	200				
4.000	000.0	0.00	M257,115	0.00	3330.900	0.000	2841.023	0.000	2898,183
4.100		000.0		0.000	3330.000	0.000	2815.435	0.00	2442.674
4.150		0.00		000.0	3330.000	0.00	7789. 6H7	0000	2815.75E
13,14,55,1CLP.		20.	0.233KLVS.						

CARCID CARRESTON DESCRIPE AND ARCHARDED COMPARED RESERVANTE BURRESTON DE COMPARED COMPARED DE COMPARED

T (MS)	נרו	ເມ	re3	8	• 1 <sup>1</sup> 0	<b>9</b> 50	<b>3</b>	16.403	Tenot
•		6	•	105036 643	6	6	105074 843	000 000	. 040
000.0				105040			104040	10.40	VE
201.		0000	00.00	2 / C. Acat	016.6		100.00000	VO 1	7.0.166
.200		0000	0.00	105920.961	000.0	0000	107444.583	1967,930	2035.510
300		0.00	0.000	105994.607	0.000	0.000	109707.923	1956,165	2101.528
400	139550.592	00000	0000	106264.745	0.000	0.000	111A77.054	1944, 382	2157.219
	,							•	
.500	_	0.00	0.000	104799.032	0.000	0.000	114032,949	1935,244	2225.348
. 600	_	000	0000	107658.104	0.00	0.00	114174.282	1926,955	2273,362
700	138917.757	000*0	0.000	108911.217	0.00	0.000	118383.912	1919,727	2311.494
900	_	00000	00000	110611.467	0.00	0.000	129614.139	1912,151	2334.006
900	_	000.0	000.0	112678.577	00000	.000	122272.072	1899,193	2312.215
	,						1	!	,
1.000	137500.	0000	0.00	115107.843	0.00	0.000	123405,579	1879.436	2254,567
1.100	_	000.0	0.000	117889.329	0.00	0.000	125125.704	1853,264	2184.473
1.200	_	00000	0.000	120958.631	0.00	0.000	127043.6A1	1822.030	2116.536
1.300	_	000.0	0.000	124183,744	0.00	0.000	129245.489	1787.784	2055.066
1.400	_	0.00	0000	127377.847	00000	0000	131456.590	1752,878	1999,561
		•	0	-	6	6	004 605551	900	6 6 40 6
96.	133630.070				•		133376.460	1117011	******
900		000		134564 989		•	100 000000	COL - 1001	1991.953
1.700	101956.101	0000	000.0	-			101.00.001	000 000	011-0001
1.A00	131485.482	000.0	0000		0000	0000	135000165	1636.939	6010
1.900	131347.36	0.000	0.00		0000	0.000	134660,343	1608.983	1777.594
		•		•		•			
2.000	131404.679	000.0	0.00	1110160461	0.00.0	00000	133500,313	261.7941	1 / 40 403
2.100		00.0	0000		000.0	0000	131344,475	0.4.1961	1 107 533
2.200	13184.679	000.0	9.000	<b>-</b>	0000	00000	129261.521	1550.110	1672,582
2.300	_	000.0	0.000	-	000.0	0.000	127030.659	1535,310	1642.425
2.400	132530.219	0.000	0.00	128656.838	0000	000-0	124856.696	1523,236	1615.211
	•	•	•	136 460461	6	•	915 037551	1613 738	4000
000	210.000.000.			٠-			, 4		1567 266
0000				133488 844			10001	*** **********************************	1070707
2.700		0000	000.0	123598.004	•		11101411	1.0001	1000
200	134°470771	9		120020 404			115440 201	1402 625	1512 820
006.9	153441.01	•	00.0	15 477.0				1476.163	1116.000
3.000	134177.883	00000	0000	119719.078	00000	0.000	113965.858	1490,361	1498,057
3.100	134390.68	000	0.00	Ξ	000.0	0.00	2503.	1489,029	1444.755
1.200	134584.28	00000	0000	117612.131	0.00	0.000	111351.948	1488,379	1472,747
3.300	_	00000	0.00	116695.066	0.000	0.000	110201,338	1498.247	1461.992
3.400	134902.	0.00	00000	114321.723	0.000	0.000	109104,143	1471.939	1451.499
			•	***************************************	8			990 0001	***
3.500	_	0000	00000	929.022601	0000	000.0	114 000 101	COC+ 0001	
3.490	134902	0.000	0.000	106482.901	0000	00000	105230,240	0/1-0657	1407.230
3.700	134902	000.0	0.000	104344.945	0000	00000	C > 2 2 2 2 5 1 1	1300,034	1363,506
3.900	_	0000	0.00	102445.327	000.0	0.00	101492.375	1343.999	1361.259
3.900	134402.034	000.0	0.00	100711.465	0000	0.000	90#54.671	1323.286	1340.245
•	124603.034	6		761.00100	000		94151,195	1303,733	1720.435
	***************************************			07466			94945 956	1285,274	147 1051
0.1.4	**************************************			04650000			04184.412	1274 707	1201.036
		00000	001.0	CC#*25467	000.00	0000	314 000 104	1010101	05:1414
つい・シン・ソート	Ch. re. relo		• C 7 3 7 K L 7 3 •						

( SM) +	Et.1	F. 1	Eda	£1.4	F64	Sdai	74	FKLA	FKG4	Misi
6	7CF CB7 AOF	č	1341 908	000	14.	0.0	6	6	•	104340 677
		; <	1 151 1		4.4	•	5			14. 076766
			1667 436		7		3			111000000
		9		200			? :	A	001.0	#10 * 60 E E F
	394128	60	Ι,	0000		*2 K	000.0	00000	0.00	346.358.232
04.		•	CH4. E0.2	000.0	413.44	104.	2	000.0	0.00	396355.890
2,500	392698, 326	90	3117.970	0	έ,	3.230	00000	0000	000	396351
000		2	4101,997	9	49.35	5.927	00000	00000	0000	306344
		000.0	5440.857	00000	95.		100	00000		396331
	387870.686	00.	7237 A71	0	. 05	A. 50	3,713	00000	- 00.	396307
	384969.A21	0	9570,30A	0	655.45	•	42.A57	0.00	.031	396
0000	380981,179	0	2515,75	9	503.64	Š	156, 199	00	1117	396209
2	175551.547	6	41.77.34	2	8	84.000	9	5	7.30	306119
200	368297.533	0	20467,393	000	303.			000.0		305094
1.300	354968.756	0	528A.13	0	8		629	6		395 A 37
1.400	347031.901	0000	30625.095	0.000	905.2H	228.347	2833,541	0.00	21.521	395645.712
1.500	332749.149	00	_	000.0	0	6	0.01	0	51.741	395454,634
004	116224.005	0	-	000	2		6953,324	Š	111.740	395302,228
1.700	297891.877	0	5	0.00	ď	٦,	. 9	00	219,439	39526.297
. A00	278337.900	0	_	0.000	9	7.0	3684.61	0	392.472	395252,755
000	258174.265	. 0	55140,219	0.000	8	272.857	962	000.0	650.459	395419.675
										,
2.000			•	0.000	Ę	÷	2	ê.	7.724	395670.443
5.100	•	0.000	Ξ.	0.000	88398.256	239.340	~∶	000.0	5	395955.781
2.200			7.97	0.00	100884.173	•	8	è.	0.306	396264.505
c	179254.790		595.55	000.0	13140.87	ċ	697.43	6	6.034	396620.591
2.400	140689.735		300.	2	25223.96	ď	44257,333	ê	5.47.5	397184.752
2.500	142617.91	00000	63851,570	000	37039.90	202.445	49827.06	ë.	373.67	397912.569
2.400	124 993,00	0.000	64241,222	.000	49244.16	196.924	55357,72	ç	333,27	3366.3
2.700	107774.	000.0	64503,011	000	159257.470	191.523		000.0	6376,973	J
2. A00	955.71	0.000	64703,936	000.	69970.41	186.401	64186.62	٩	495,33	9696
2.900	74510.370	0.00	•	000.	80414.07	181.485	71455.78	٠.	685.39	00106.1
000	58414.263	•	64993,496	000		176.733	5	0		0741.32
3,100	1		65107.381	000	96.	172,152	6	6	35	01402.55
3.200	27185.45	000.0		000	==	157.716	96607.456	0.000	12501.514	Ñ
3,300		•	65310.2AB	.000	.85	163.469	1436.85	90.	79	02805.81
3.400	244.517	00000	62572,538	.000	228982.311	00000	154,28	.00	77	03363.42
00 Y . E	244.517	6	54036,401	900	401-75165		1.57	9	16642,880	403799.
	: :		40531 101		i	•	1		12126	404047
	: :	3	44062 684		1	•		•		A0425B
	244.517		43014.394		ň	•			1941.091	404450
000	244.517	000	40269,223	000	227598-005	00000	116389,389	000 0	20137.130	404629
,					,	•	•	;		
000.4	244.517	0.00	37786.790	000	224136.455	000	119737.767	00.0	20893.133	5
001.4	244.517	٠,	35536.720	000-	224673.521	.000	5	ë.	161	04953.63
0.1.4	244.517	0.0	34287.953	• 000	223797.A13	.000	Ę	٥.	22026.001	405065.695
13.17.30.HCL	LP. FA. TM160	. SC •	0.233KL4S.							

၁၀	.540	54	ď	8	: 3	C	Į,	35	E.		.580	ď	ď		58	580	5	Œ	590	8		, ,	\$	5	.580	ď	28	Ř	53	.540	53	S.	Š.	.580	5	ŝ	S.	£	ď	8			.580	ď	£ 5.	.233KLNS
F.	•	6.	00	5		•	00.	.00	0	0	6	S	2		0	0.000	9	2	00000	0	5	=	.0	:	0000	.00	.00	8	ê	000.0	ë.	0.	00	0.000	ē	٥	00.	9	0				0.00	ë.	00000	6n2c. 0
013	0.00	67.03	00-10	77 38		,	50.91	293.60	744.58	359.60	۲.	20.05	870 A2	A 6 6 6 8 1	674.07	11756.374	3713.61	5355.07	16543.380	7275.94	7463 93	7.64	7407.79	7144,30	104	6436.58	4072.60	5730.5	5432.31	15134.727	4A50.36	45A3.62	4329.08	14086.709	3862.81	3641.68	0.0	6	0	6	6	000	0.000	6.	000	TEI.
T (MS)	0	:	. 5	2	000		50	50	2	£		5	2			1.400	ŝ	9	1.700		6	•	9	:	2.200	33	04.	50	9	2.700	ŝ	6	00	3.100	.20	.30	9	Š	4					=	4.140	02.1

#### **GLOSSARY**

- $A_1$  Cross section area of the liquid reservoir, cm<sup>2</sup>.
- $A_3$  Cross section area of the combustion chamber, cm<sup>2</sup>.
- $A_{\lambda}$  Cross section area of the gun tube, cm<sup>2</sup>.
- A. Vent area, cm<sup>2</sup>.
- b Covolume, cm<sup>3</sup>/gm.
- c<sub>1</sub> Speed of sound in the liquid in the reservoir, cm/s.
- $c_{L3}$  Speed of sound in the liquid in the combustion chamber, cm/s.
- $c_{L4}$  Speed of sound in the liquid in the gun tube, cm/s.
- $c_{G3}$  Speed of sound in the gas in the combustion chamber, cm/s.
- $c_{G4}$  Speed of sound in the gas in the gun tube, cm/s.
- c<sub>3</sub> Average speed of sound in the combustion chamber, cm/s.
- $c_4$  Average speed of sound in the gun tube, cm/s.
- c<sub>p</sub> Specific heat at constant pressure, joules/gm-K.
- $c_v$  Specific heat at constant volume, joules/gm-K.
- $\mathbf{C}_{\mathbf{D}}$  Discharge coefficient for the piston.
- $C_{\mathrm{D}}^{\prime}$  Discharge coefficient for the gun tube.
- e<sub>1</sub> Chemical energy of the liquid, joules/gm.

- e<sub>3</sub> Internal energy of the gas in the combustion chamber, joules/gm.
- e<sub>4</sub> Internal energy of the gas in the gun tube, joules/gm.
- E<sub>1</sub> Total internal energy of the liquid, joules.
- E<sub>3</sub> Total internal energy in the gas in the chamber, joules.
- $\mathbf{E}_{\Delta}$  Total internal energy in the gas in the gun tube, joules.
- $\mathrm{EK}_{\mathrm{G4}}$  Kinetic energy of the gas in the gun tube, joules.
- EK<sub>1.4</sub> Kinetic energy of the liquid in the gun tube, joules.
- $\mathsf{EK}_{\mathsf{pj}}$  Kinetic energy of the projectile, joules.
- $\mathsf{EK}_{\mathsf{DS}}$  Kinetic energy of the piston, joules.
- $g_0$  Conversion constant =  $10^7$  gm/s-cm-MPa.
- h<sub>1</sub> Liquid enthalpy in the reservoir, joules/gm.
- h<sub>L3</sub> Liquid enthalpy in the combustion chamber, joules/gm.
- $h_{G3}$  Gas enthalpy in the combustion chamber, joules/gm.
- $h_{L4}$  Liquid enthalpy in the gun tube, joules/gm.
- $h_{G4}$  Gas enthalpy in the gun tube, joules/gm.
- K Bulk modulus, MPa.
- K<sub>1</sub> Bulk modulus at zero pressure, MPa.
- K<sub>2</sub> Derivative of the bulk modulus, MPa.

- $M_{G3}$  Gas mass in the combustion chamber, gm.
- ${\rm M}_{\rm G4}$  Gas mass in the gun tube, gm.
- M<sub>1</sub> Liquid mass in the reservoir, gm.
- $M_{L3}$  Liquid mass in the combustion chamber, gm.
- $M_{L4}$  Liquid mass in the gun tube, gm.
- ${\bf M}_{\rm T}$  Total propellant mass in the system, gm.
- M<sub>pj</sub> Projectile mass, gm.
- $M_{ps}$  Piston mass, gm.
- $\dot{m}_{13}$  Mass flux into the combustion chamber, gm/s.
- $\dot{m}_{34}$  Mass flux into the gun tube, gm/s.
- $\mathring{\text{m}}_3$  Rate of gas formation in the combustion chamber, gm/s.
- $\dot{m}_{L}$  Rate of gas formation in the gun tube, gm/s.
- $P_1$  Pressure in the liquid reservoir, MPa.
- $P_3$  Pressure in the combustion chamber, MPa.
- $P_4$  Average pressure in the gun tube, MPa.
- ${\bf P}_{\bf L}$  Pressure at the gun throat, MPa.
- $\mathbf{P}_{\mathbf{R}}$  Pressure at the base of the projectile, MPa.
- $\mathbf{P}_{\mathrm{RS}}$  Projectile resistance pressure, MPa.

- R Universal gas constant = 8.318 joules/mole-K.
- S<sub>pi</sub> Projectile travel, cm.
- S<sub>ps</sub> Piston travel, cm.
- $T_3$  Temperature in the combustion chamber, K.
- $T_4$  Average temperature in the gun tube, K.
- $v_1$  Volume of the liquid reservoir, cm<sup>3</sup>.
- $v_3$  Volume of the combustion chamber,  $cm^3$ .
- $V_4$  Volume of the gun tube behind the projectile, cm<sup>3</sup>.
- $V_{L3}$  Liquid volume in the combustion chamber, cm<sup>3</sup>.
- $V_{G3}$  Gas volume in the combustion chamber, cm<sup>3</sup>.
- $V_{L4}$  Liquid volume in the gun tube, cm<sup>3</sup>.
- $V_{G4}$  Gas volume in the gun tube, cm<sup>3</sup>.
- $v_{\rm pj}$  Projectile velocity, cm/s.
- $V_{ps}$  Piston velocity, cm/s.
- W Molecular weight of the gas, gm.
- $\epsilon_3$  Porosity of the combustion chamber.
- $\epsilon_4$  Porosity of the gun tube.
- γ Ratio of specific heats.

- $\rho_1$  Liquid density in the reservoir, gm/cm.
- $\rho_{L3}$  Liquid density in the combustion chamber, gm/cm.
- $\rho_{L4}$  Liquid density in the gun tube, gm/cm.
- $\rho_{G3}$  Gas density in the combustion chamber, gm/cm.
- $\rho_{\mbox{\sc G4}}$  Gas density in the gun tube, gm/cm.

A STATE OF S

No. of	Omandonte	No. of	0
Copies	Organization	Copies	Organization
2	Commander Defense Technical Info Center ATTN: DTIC-DDA Cameron Station Alexandria, VA 22304-6145	1	Commander US Army Armament, Munitions and Chemical Command ATTN: SMCAR-ESP-L Rock Island, IL 61299
1.	Director Defense Advanced Research Projects Agency ATTN: H. Fair 1400 Wilson Boulevard Arlington, VA 22209	1	Commander US Army Aviation Research and Development Command ATTN: AMSAV-E 4300 Goodfellow Blvd. St. Louis, MO 63120
1	HQDA DAMA-ART-M Washington, DC 20310	1	Director US Army Air Mobility Rsch. and Development Lab.
1	Commander US Army Materiel Command		Ames Research Center Moffett Field, CA 94035
	ATTN: AMCDR-ST 5001 Eisenhower Avenue Alexandria, VA 22333-0001	1	Commander US Army Communications Electronics Command ATTN: AMSEL-ED
	Commander Armament R&D Center		Fort Monmouth, NJ 07703
	US Army AMCCOM ATTN: SMCAR-TSS SMCAR-SCA, M. Devine SMCAR-SCA-T, R. Yalamanchili		Commander ERADCOM Technical Library ATTN: STET-L Ft. Monmouth, NJ 07703-5301
	Dover, NJ 07801	1	Commander US Army Harry Diamond Labs
-	Commander Armament R&D Center US Army AMCCOM ATTN: SMCAR-LCA, D. Downs		ATTN: DELHD-TA-L 2800 Powder Mill Rd Adelphi, MD 20783
	A. Beardell SMCAR-LCE, N. Slagg SMCAR-LCS, W. Quine SMCAR-TDC, D. Gyorog Dover, NJ 07801	1	Commander US Army Missile Command ATTN: AMSMI-R Redstone Arsenal, AL 35898
_	Director Benet Weapons Laboratory Armament R&D Center US Army AMCCOM ATTN: SMCAR-LCB-TL P. Votis		Commander US Army Missile Command ATTN: AMSMI-YDL Redstone Arsenal, AL 35898
	Watervliet, NY 12189		

No. of Copies	Organization	No. of Copies	Organization
1	Commander US Army Belvoir R&D Ctr ATTN: STRBE-WC Tech Library (Vault) B-315 Fort Belvoir, VA 22060-5606	2	Commander US Naval Surface Weapons Ctr. ATTN: O. Dengel K. Thorsted Silver Spring, MD 20910
1	Commander US Army Tank Automotive Cmd ATTN: AMSTA-TSL Warren, MI 48090	1	Commander Naval Weapons Center China Lake, CA 93555
1	Commander US Army Research Office ATTN: Tech Library P.O. Box 12211 Research Triangle Park, NC	1	Commander Naval Ordnance Station ATTN: C. Dale Code 5251 Indian Head, MD 20640
1	27709-2211  Director US Army TRADOC Systems Analysis Activity	1	Superintendent Naval Postgraduate School Dept of Mechanical Eng. ATTN: Code 1424, Library Monterey, CA 93943
	ATTN: ATAA-SL White Sands Missile Range NM 88002	1	AFWL/SUL Kirtland AFB, NW 87117
1	Commandant US Army Infantry School ATTN: ATSH-CD-CSO-OR Fort Benning, GA 31905	1	Air Force Armament Lab ATTN: AFATL/DLODL Eglin, AFB, FL 32542-5000
1	Commander US Army Development and Employment Agency	1	AFOSR/NA (L. Caveny) Bldg. 410 Bolling AFB, DC 20332
	ATTN: MODE-TED-SAB Fort Lewis, WA 98433	1	US Bureau of Mines ATTN: R.A. Watson 4800 Forbes Street
1	Commander Naval Surface Weapons Center ATTN: Code G33, J. East Dahlgren, VA 22448	1	Pittsburgh, PA 15213  Director Los Alamos Scientific Lab ATTN: D. Butler P.O. Box 1663 Los Alamos, NM 87545

No. of Copies	Organization	No. of Copies	Organization
. 1	Director Jet Propulsion Lab ATTN: Tech Lib 4800 Oak Grove Drive Pasadena, CA 91109	2	General Electric Company Armanent Systems Department ATTN: E. Ashley M. Bulman Burlington, VT 05401
2	Director National Aeronautics and Space Administration ATTN: MS-603, Tech Lib MS-86, Dr. Povinelli	1	Science Applications, Inc. ATTN: R. Edelman 23146 Cumorah Crest Woodland Hills, CA 91364
	21000 Brookpark Road Lewis Research Center Cleveland, OH 44135	2	TRW Electronics & Defense ATTN: D.R. Ausherman M.P. Bronstein One Space Park, 134/9048
1	Director National Aeronautics and Space Administration	1	Redondo Beach, CA 90278
	Manned Spacecraft Center Houston, TX 77058	1	Veritay Technology, Inc. ATTN: E. B. Fisher 4845 Millersport Highway, P.O. Box 305
1	The BDM Corporation ATTN: Dr. T.P. Goddard P.O. Box 2019		East Amherst, NY 14051-0305
	2600 Cearden Rd, North Bldg Monterey, CA 93940	1	Director Applied Physics Laboratory The Johns Hopkins Univ. Johns Hopkins Road
1	Calspan Corporation ATTN: Tech Library P.O. Box 400		Laurel, Md 20707
	Buffalo, NY 14225	2	Director Chemical Propulsion Info Agency
1	Food & Machinery Corporation Northern Ordnance Division ATTN: J. Oberg Columbia Heights Post Office Minneapolis, MN 55421		The Johns Hopkins Univ. ATTN: T. Christian Tech Lib Johns Hopkins Road Laurel, MD 20707
3	General Electric Ord. Sys Dpt ATTN: J. Mandzy, OP43-220 R.E. Mayer H. West 100 Plastics Avenue	1	Pennsylvania State University Dept. of Mechnical Eng ATTN: K. Kuo University Park, PA 16802
	Pittsfield, MA 01201-3698	1	University of Michigan Gas Dynamics Laboratory Aerospace Engineering Bldg. ATTN: G. M. Faeth Ann Arbor, MI 48109-2140

# No. of Copies Organization

Princeton Combustion Rsch Laboratories, Inc. ATTN: N.A. Messina M. Summerfield 475 US Highway One North Monmouth Junction, NJ 08852

1 University of Mississippi Mechanical Engineering Department ATTN: C.R. Wimberly University, MS 38677

1 University of Arkansas
Department of Chemical
Engineering
227 Engineering Building
Fayetteville, AR 72701

### Aberdeen Proving Ground

Dir, USAMSAA

ATTN: AMXSY-D

AMXSY-MP, H. Cohen

Cdr, USATECOM

ATTN: AMSTE-TO-F

CDR, CRDC, AMCCOM

ATTN: SMCCR-RSP-A

SMCCR-MU SMCCR-SPS-IL

#### USER EVALUATION SHEET/CHANGE OF ADDRESS

This Laboratory undertakes a continuing effort to improve the quality of the reports it publishes. Your comments/answers to the items/questions below will aid us in our efforts.

1. BRL Rep	port Number	Date of Report
2. Date Re	eport Received	
	his report satisfy a need? of interest for which the r	(Comment on purpose, related project, or eport will be used.)
		ing used? (Information source, design
as man-hour		led to any quantitative savings as far ng costs avoided or efficiencies achieved
		nk should be changed to improve future ation, technical content, format, etc.)
	Name	
CURRENT	Organization	
ADDRESS	Address	<del></del>
	City, State, Zip	
'. If indi	cating a Change of Address of ect Address in Block 6 above	or Address Correction, please provide the and the Old or Incorrect address below.
	Name	
OLD ADDRESS	Organization	<del></del>
	Address	
	City, State, Zip	

Participation of the participa

(Remove this sheet along the perforation, fold as indicated, staple or tape closed, and mail.)

	— — FOLD	HERE	
Director			NO POSTAGE
U.S. Army Ballistic Research ATTN: SLCBR-DD-T	Laboratory		NECESSARY IF MAILED
Aberdeen Proving Ground, MD	21005-5066		IN THE UNITED STATES
OFFICIAL BUSINESS	r <del></del>		
PENALTY FOR PRIVATE USE, \$300	BUSINESS FIRST CLASS PERMIT	REPLY MAIL NO 12062 WASHINGTON, DC	
	POSTAGE WILL BE PAID	BY DEPARTMENT OF THE ARMY	
Direct	or		
U.S. A	rmy Ballistic Res SLCBR-DD-T	earch Laboratory	
Aberde	en Proving Ground	, MD 21005-9989	

- FOLD HERE -

and becaused microster frequency Associate presents and consistent of the consistent and consistent of the consistent and cons